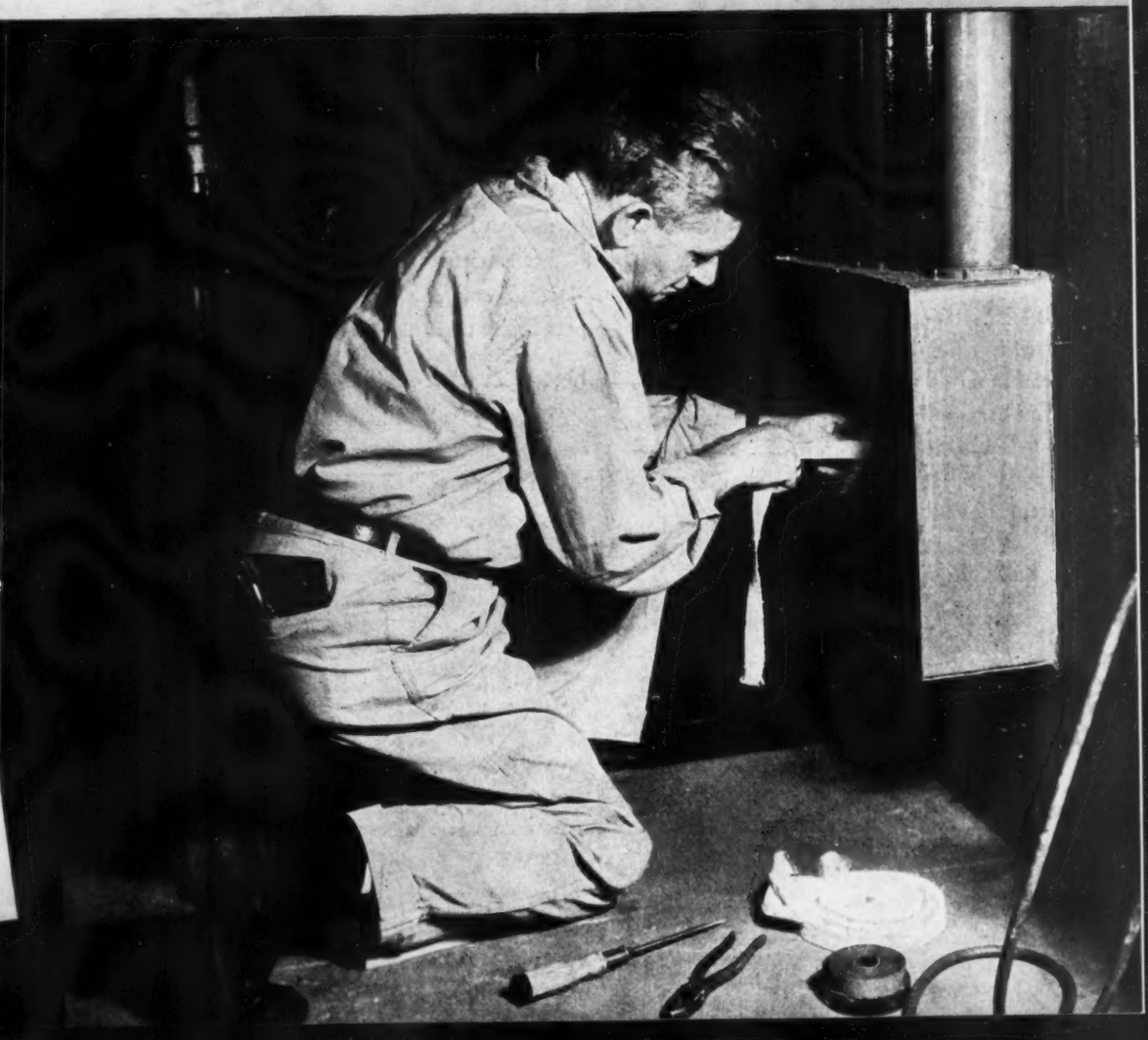
Electrical Contracting

THE MAGAZINE OF ELECTRICAL CONSTRUCTION

SEPTEMBER, 1941

The 225,000 members of IBEW make up the most powerful group in the electrical construction industry. What do you know about IBEW? Read some plain talk on page 7 in this issue.

INDUSTRIAL ELECTRIFICATION SECTION
PAGES 55 to 70



Power where you need it

WITH PYRANOL TRANSFORMERS

NO VAULTS REQUIRED—SO YOU SAVE TIME • SPACE • MATERIALS

SAVE TIME

It's easy to install Pyranol transformers. Just set them down by the load (or on an overhead beam), run in light-weight primary feeders, and make connections.

SAVE SPACE—MATERIALS

Putting the transformers close to the load saves on the cost of secondary feeders. And because Pyranol, the transformer cooling liquid, is noninflammable, out-of-the-way installations are easy to make—no fireproof vault is needed.

SAVE ON OPERATION

Short feeders between transformers and load mean less drop in voltage, lower losses, higher efficiency. And since Pyranol is nonsludging and chemically stable, upkeep is practically negligible.

Figure out what these savings can mean in *your own plant*. You'll find, for speedy economical expansion of your power system, Pyranol transformers are a time- and money-saving answer.

Other Aids to Overloaded Systems

AIR-COOLED TRANSFORMERS

Like Pyranol transformers, these units can be installed indoors close to the load to obtain greater capacity—plus savings in both time and materials. Particularly adapted to circuits 600 volts and below. Described in Bulletin GEA-897.

PYRANOL CAPACITORS

If power-factor is low, you can boost wiring capacity 10 to 40 per cent with Pyranol capacitors. They neutralize reactive (nonworking) current and make room for more load. Moreover, they may save enough in power costs to pay for themselves in one to three years. Described in Catalog GEA-77.

AIR-COOLED INDUCTION REGULATORS

Over-loaded circuits mean low voltage and inefficient operation of motors and lamps. G-E air-cooled induction voltage regulators will bring performance back to standard. And indoor installations are easy to make—no vault is required. Described in Bulletin GES-2285.

Call your G-E representative now for more information on load-center distribution. Ask for Bulletin GEA-2277. General Electric, Schenectady, N. Y.

GENERAL ELECTRIC

402-34

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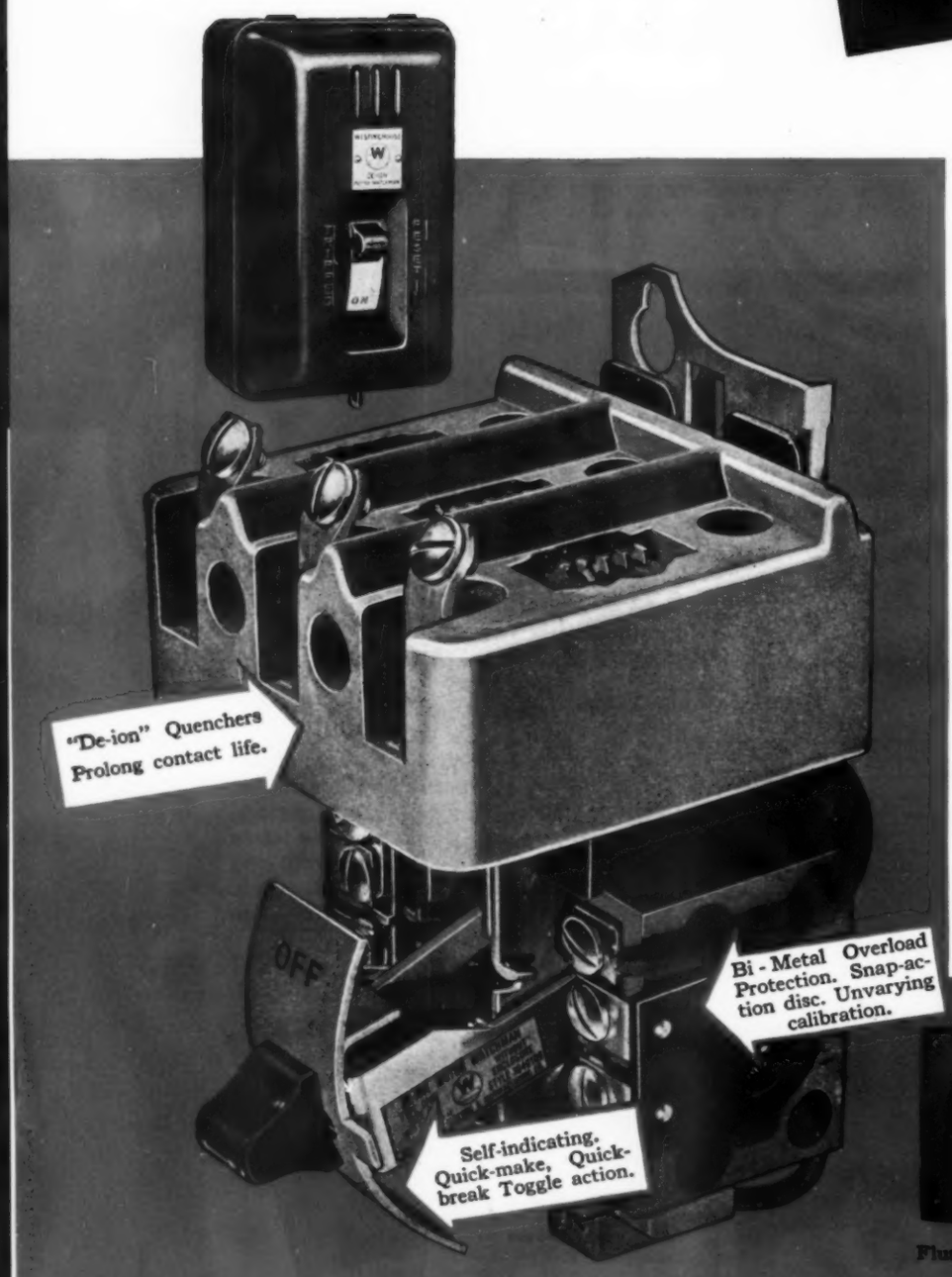
IT'S EASY TO see

"ON" "TRIPPED" "OFF"



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Easy To Install

Compact design but with ample wiring space. Concentric knock-outs on top, bottom and sides make installation easy. Top screw holes in back of cabinet are keyhole-shaped. Bottom holes oblong for quick lining up. Straight-through wiring — line to top — load at bottom.

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"De-ion" quenchers prolong contact life. Bi-metal provides unvarying accurate overload protection. Trip-free switch — cannot be held closed against overload. Quick-make, quick-break prevents "teasing". All metal parts tinned or cadmium-plated. Silver-to-silver, double-break contacts. Deep-drawn cover and contact inspection window on arc quencher make maintenance easy.

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For Motor Control and Circuit Protection

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Magnetic motor starter—motor-circuit switch—motor overload protection—nofuze circuit protection—all in one unit. Bi-metal gives permanently accurate overload protection. "De-ion" quenchers protect contacts—save maintenance. Four-in-one Unit saves installation time—saves space—saves wiring—provides greater protection for operators.

WESTINGHOUSE SAFETY SWITCH

For Circuit Protection

Diamond-pointed break jaw and extended-blade construction prevent burning and beading of contacts. One-piece copper construction saves money by preventing power loss. Quick-make, quick-break on Types A and C. Ample space for wiring. Solderless lugs. "De-ion" arc quenchers on 575-V switches.

WESTINGHOUSE AB-I BREAKER

For Circuit Protection

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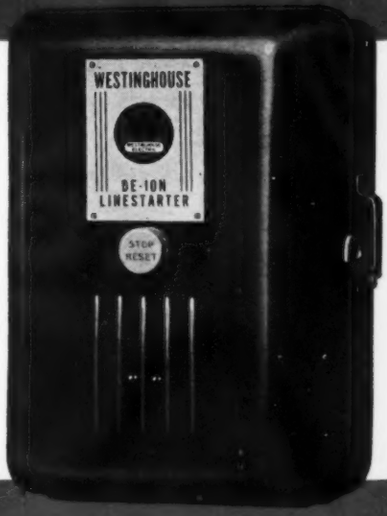

WESTINGHOUSE "DE-ION" LINESTARTER

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Push-button operated—built-in or mounted separately. Small, compact construction saves space. Bi-metal overload protection — hand or automatic reset. "De-ion" protection for contacts reduces maintenance. Vertical magnet operation speeds contact opening and prevents accidental operation.

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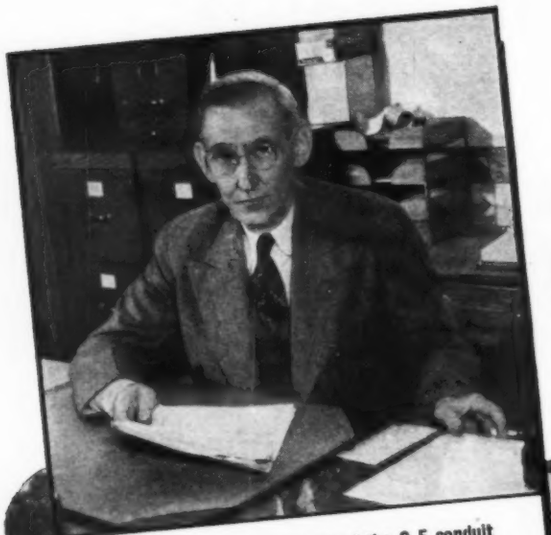
Motors and Control



F. H. Mains, Superintendent of the G-E conduit factory at New Kensington, Pa.

Mr. Mains began working in the production department of this factory in 1912. In the 29 years since then he has been intimately associated with all phases of conduit manufacture. Mr. Mains is in charge of all manufacturing operations—production, maintenance, quality control, and inspection.

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G-E Conduit Factory at New Kensington, Pa.

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For further information about G-E Conduit see the nearest General Electric Merchandise Distributor or write to Section C-189, General Electric Company, Appliance and Merchandise Department, Bridgeport, Connecticut.

GENERAL ELECTRIC

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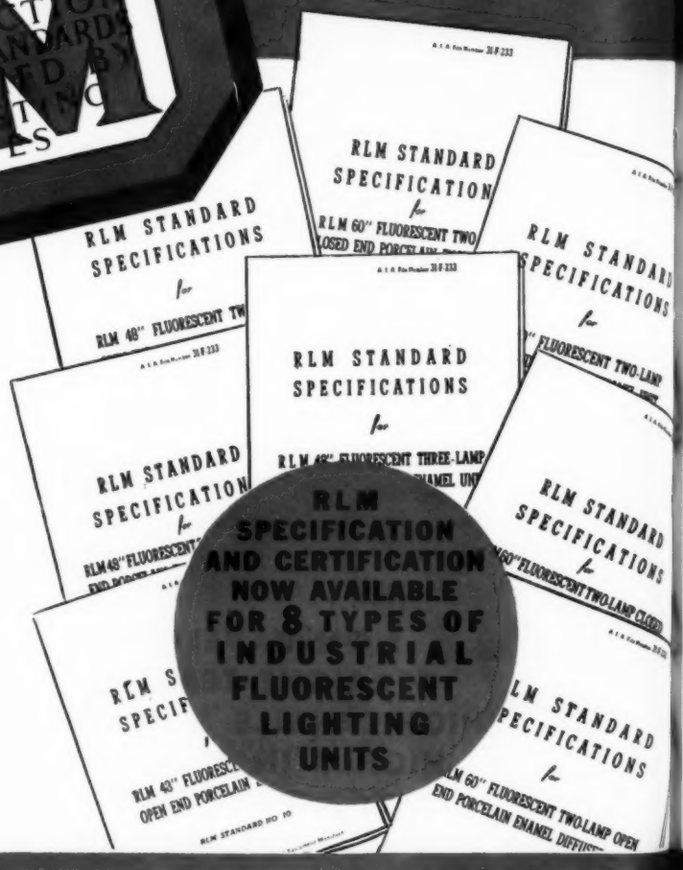
This Label on an Industrial Fluorescent Lighting Unit Certifies that it has been Manufactured in Compliance with Quality-Assuring Specifications under the Exacting Procedure Developed and Administered by RLM Standards Institute



YOUR GUIDE TO UNIFORM, HIGH QUALITY AND TROUBLE-FREE OPERATION

Today, with the National Defense Program calling for maximum production...and with skilled workers at a premium...*better seeing* has become a first essential for both night and day workers.

In meeting this responsibility by providing better light for better sight, insist on industrial lighting fixtures bearing the RLM Label. This simple buying step is your best assurance that the lighting units you install will provide the maximum value in lighting efficiency and economy . . . give maximum protection to the eyesight and health of your workers, and help them maintain high standards of accuracy and efficiency.

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All RLM certified fluorescent lighting units are guaranteed against mechanical and electrical defects for a period of ninety (90) days from date of delivery to the purchaser. Correction of such defects by repair or replacement of material only shall constitute fulfillment of all obligations under this guarantee by the undersigned manufacturer or its distributor.

RLM certified fluorescent lighting units are engineered for operation with Mazda fluorescent lamps to give maximum light output and trouble-free operation when properly installed and under normal conditions of use.

WRITE FOR COPIES OF THESE SPECIFICATIONS

The RLM Standards Institute is a non-profit organization operated to develop and promulgate standard specifications for the efficient performance of industrial lighting equipment.

A few of many eminently satisfactory installations of fluorescent lamp fixtures made by F. W. Wakefield Brass Co., Vermillion, Ohio —all equipped with Jefferson Electric Ballasts.

Fluorescent Lighting AT ITS BEST

INSURED BY JEFFERSON CERTIFIED BALLASTS

No question about the improved appearance, improved illumination and greater efficiency provided by properly designed and installed fluorescent fixtures—but for the most satisfactory performance it is well recognized that the ballasts used must be carefully selected.

Experienced fixture manufacturers, engineers and installation contractors know the important part that the ballasts play—and their use of Jefferson Electric Ballasts again attests the quality of Jefferson-made products.

When considering fluorescent lighting specify Jefferson Electric Ballasts for maximum results and minimum servicing... JEFFERSON ELECTRIC COMPANY, Bellwood, (Suburb of Chicago), Illinois. Canadian Factory: 60-64 Osler Avenue, W. Toronto, Ont.

CERTIFIED E.T.L. SPEC NO 6 HIGH P.F.

CERTIFIED BY ELECTRICAL TESTING LABORATORIES

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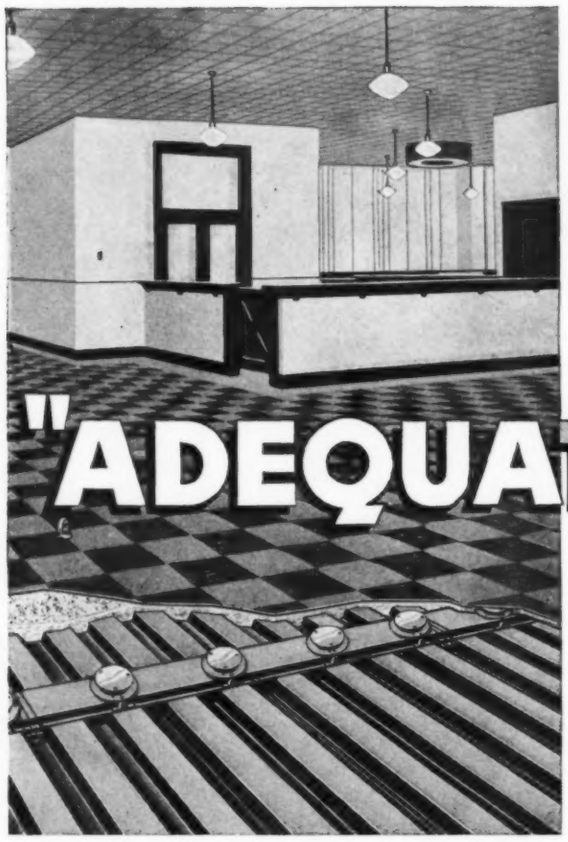
LISTED AS STANDARD BY UNDERWRITERS' LABORATORIES, INC.

Lamp design—electrodes, filling pressures, length, diameter, current density, voltage and current, etc.—is based on the best performance of lamps for efficiency, maintenance, life. These basic factors determine the units of electrical specifications for ballasts.

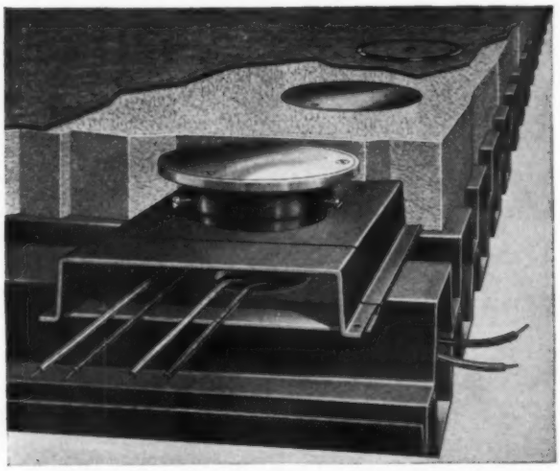
Because of these requirements, the fluorescent lamp manufacturers guarantee the performance of their lamps only when used with those ballasts which meet the specified performance, as tested by Electrical Testing Laboratories, or other laboratories of recognized standing. This is a logical safeguard set up by the fluorescent lamp manufacturers to insure proper lamp performance.

Underwriters' Laboratories' approval of equipment requires that the device meet established standards as far as fire hazard and danger to life and property are concerned. • Your self-interest and the ultimate satisfaction of your customer should prompt you to be sure you get Ballasts with the "E.T.L." Certification label or insignia stamped in the case.

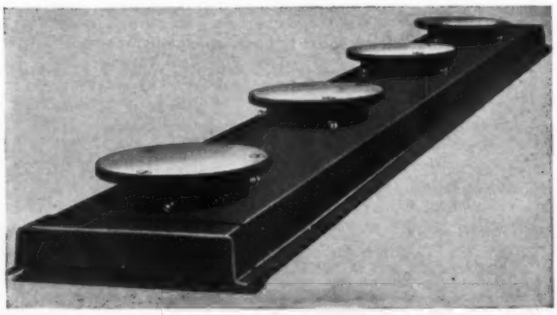
JEFFERSON ELECTRIC
FLUORESCENT LAMP BALLASTS



Showing how Q-Floors form a series of cellular steel wiring raceways which extend over the entire floor area.



Showing details of adequate wiring in Robertson Q-Floors which make it possible to install electrical floor outlets in any 6-inch square over the entire floor area.



Showing details of a standard Floor Header with hand holes through which every large-capacity, steel enclosed wireway in Robertson Q-Floors can be reached.

HOW Q-FLOORS provide for "ADEQUATE WIRING" permanently!

● Q-Floors are *always* electrically alive, never can become obsolete, for they provide 100% electrical availability, this year, next year, and every year after. How they provide "Adequate Wiring" permanently is illustrated here. Of themselves, Q-Floors form a series of cellular steel wiring raceways which are easily accessible through a system of headers or cross channels. Every type of wiring, both high and low tension, can be carried through floor outlets to any 6-inch square over the entire floor whenever needed.

So rapidly have come new electrical developments that few buildings have kept pace with them. As a result many structurally sound and relatively new buildings are obsolete today . . . because the floors fail to provide for *adequate wiring.*

Q-Floors are the cure for such obsolescence. They mean greater profits for you and greater satisfaction for your customers. They help cut down your overhead because your crews work continuously. There is no reduction in productive labor and materials. Detailed drawings and descriptive data furnished on request.

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ROBERTSON Q-FLOORS

The New

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Dead Front—Dependable—Medium Priced

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The following Advantages are incorporated in the (FA) Klampswitchfuz units which comprise these switchboards:

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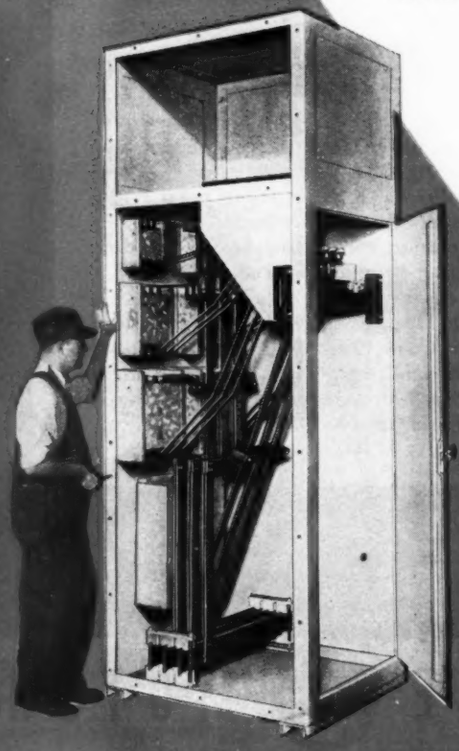
2. Contacts are silver plated, insuring low resistance.
3. Extended feeders—this eliminates tangle of cables in rear.
4. New and improved (FA) solderless lugs.
5. Clamp type fuse holders—low resistance, minimum heating.
6. Easy to replace fuses—fuses are mounted on door.
7. ON and OFF position indicator.
8. Horsepower rated.
9. Sectional, cubical construction—uniform appearance.
10. Pleasing design—pearl gray lacquer finish—easy to keep clean.
11. Integral pullbox.
12. Easy and economical to install and connect.

Capacities: 30 to 1200 amp., 250 volt DC and AC; 30 to 600 amp., 575 volt AC; in 2, 3 and 4 pole types.



Side and rear view of above, showing integral pullbox and arrangement of copper busbars

In New and Modernized Plants

this, and these other (FA) Products will serve faithfully and well: Feeder Busduct . . . Plugin Busduct . . . Shutlbrak Safety Switches . . . Power and Light Distribution Panelboards (Standard and Column Types).

(FA) *Sales-Engineers Can Help You*

Their long experience and training are at your service—without obligation. Write for the name and address of the one nearest you. And ask for complete catalog information . . . Frank Adam Electric Company, St. Louis, Mo.

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CONTENTS

With which is consolidated The Electragist and Electrical Record
Established 1901

SEPTEMBER, 1941

Departments

A SERVICE PAPER for electrical contractors, engineers, motor shops, industrial electricians and inspectors, covering engineering, installation, repairing, maintenance and management, in the field of electrical construction—industrial, commercial, and residential.

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Why? Because old, worn-out electrical circuits can't last forever... and today—according to authorities—nine out of ten plants still need new wiring.

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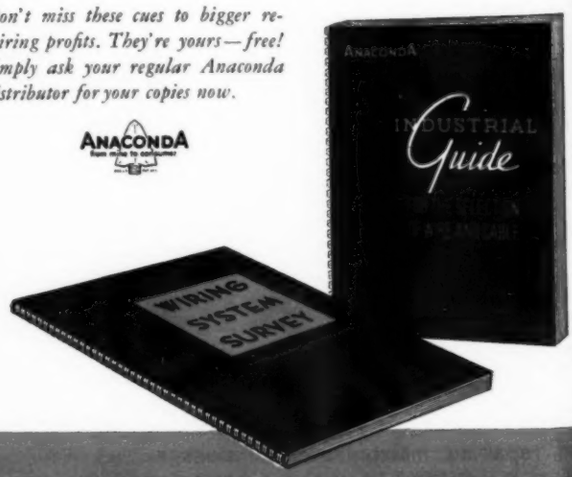


USE MODERN IMPROVED

Anaconda Wire & Cable

Electrical Contracting

SEPTEMBER, 1941

Perils Ahead

GEORGE WASHINGTON, WISE IN HIS DAY, left this nation one piece of good counsel, which we have never followed. He said—"In time of peace, prepare for war." But now the wheel turns.

GRAY HEADS IN ENGLAND AND AMERICA, who remember what happened before and after the First World War are groping today with the reverse problem. They are thinking about the perils of a sudden peace. When war orders ceased last time—work stopped, factories closed and economic turmoil followed that brought years of hard times. It must not happen again.

THIS PERIL CAN ENGULF THE ELECTRICAL INDUSTRY as well as any other, unless electrical men prevent it. And it will involve the contractor as well as the manufacturer. And only one safeguard is possible—to be ready to shift fast from war work to other markets, for which full preparation has been made.

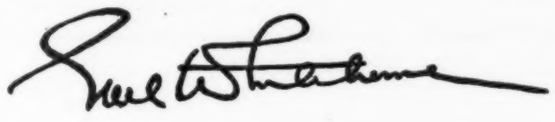
OUR GOVERNMENT IS STUDYING THIS PROBLEM. Other industries are planning new products, new services. We too can plan in many directions. Five opportunities come readily to mind.—

1. To re-wire 500,000 commercial buildings.
2. To re-light every type of commercial and public building.
3. To install full comfort wiring in 10,000,000 homes.
4. To equip 15,000,000 dwellings with efficient lighting fixtures.
5. To install front door two-way telephones in 15,000,000 houses and apartments.

WHEN ELECTRICAL MANUFACTURERS SUDDENLY lose their war orders, plans should be ready to swing without a falter into these and other new markets. But these plans won't work if they are secret and selfish. They will not roll quick and big enough unless this whole industry is organized behind them.

MUCH OF THE ELECTRICAL INDUSTRY'S opportunity, of course, will come through the sale and installation of more modern and complete equipment. So the electrical contractor is a vital part of it. The industrial plant man must be ready with his peace plans also. All must be tied in, ready and prepared. Action must be defined, agreed upon.

HOW CAN WE GO ABOUT such planning? It calls for national leadership and organization, for local participation and programs. The first move probably should be for the four national associations of our industry to set up a Joint Peace Program Committee. And it will need good men—to make this study and this plan.



You look for FRESHNESS...

for a better smoke ... That's why cigarettes are sealed in moisture-proof Cellophane

You look for FRESHNESS...

for better flavor ... That's why candies are sealed in moisture-proof Cellophane

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LOOK FOR FRESHNESS IN TAPE

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Every one who has ever used tape knows the time-saving advantages of the extra adhesiveness you get with factory-fresh tape. And when the roll inside the package is GRAYBAR tape, you're equally sure of extra strength, and freedom from pinholes or ravelling on the edges. For a clean, permanent taping job ... one that holds its adhesion longer on the joint ... be sure you get one of these GRAYBAR brands in the new Cellophane wrapped package.

GRAYBAR AMAZON

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Rubber Tape–A highly elastic rubber tape for severe service. Guaranteed minimum footage –30 feet.

GRAYBAR VICTOR

Rubber Tape – An unusual value, second in quality only to Amazon brand. Withstands 300 volts per mil of thickness. Guaranteed minimum footage–21 feet.

GRAYBAR VICTOR

Friction Tape – A high grade tape for general commercial service, with a strong tacky friction. Guaranteed minimum footage – 68 feet.

GRAYBAR STICKA

A popular priced tape suitable for ordinary service. Provides good friction, with compound worked thoroughly into the cloth. Guaranteed minimum footage–60 ft.

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Let's Talk About UNION Labor

A frank discussion of the status of organized labor in our industry. What the International Brotherhood of Electrical Workers is contributing to progress. Some bad mistakes—the fear that blocks the electrical contractors—and what to do.

By Earl Whitehorne

HOME OFFICE—*building of the International Brotherhood of Electrical Workers and the Electrical Workers Benefit Association in Washington, D. C., which houses their large insurance business and the activities of the union.*

AS everybody knows, you just can't talk about union labor. It undoubtedly presents the most difficult problem confronting the electrical construction industry today. But this topic is *tabu*. And to write about it is plain poison.

That's why the programs of electrical contractors' regional conventions avoid this subject like the plague. It is true that for the past three years, since NECA established an Industrial Relations Section, a session has been set apart at their annual meeting for the discussion of this muted theme. But it is pretty much restricted to polite platitudes in the presence of high union officials and to a "closed" meeting now and then. And the number of serious articles that I can remember seeing in the past ten years, dealing with the labor problems of this field, I can count on one hand and still have a thumb and maybe a finger free to waggle.

Two Part Industry

And so it would be interesting to have a little frank discussion of this *Hush! Hush!* subject. I would like to talk plainly about the International Brotherhood of Electrical Workers—"labor" to us—and forget that it can't be done. I would like to point out briefly some of the contributions they make to the welfare and progress of the electrical construction industry. And some of their bad mistakes, as I see them. I'd like to speak of the weakness of the present position of the employing contractor and what can be done about it. And why not?

In the first place, the majority of electrical contractors employ non-union men. But some 80 per cent of the electrical construction installed in America is done by some 20 per cent of the contractors and they employ union men. So the bulk of the work goes union. This means that this industry of ours breaks down into two parts.

On the one hand are the wiremen, 225,000 of them members of some 1,000 local unions tied into the International Brotherhood of Electrical Workers, and part of the vast American Federation of Labor. For two generations, this great army of workers has been pressing forward toward three clear cut objectives—more wages, shorter hours, better working conditions. Fighting their way ahead with strikes and threats of strikes, and later with the mere prestige of power as their chief weapon, the unions have been everywhere successful in bettering the condition of their members. And the secret of it is that they are led, both locally and nationally, by men, who are skillful in using the accumulated experience of all these years in their negotiations with the employers. And they stick to these objectives with unwavering determination.

On the other hand, are some 4,000 electrical contractors who employ these many union wiremen. They are able and successful business men—or they would not have been able to wire all the buildings in America. But they are individuals. Labor is only one of their problems. They are not wise in accumulated experience in labor negotiations, nor highly organized behind a definite objective. Many of them belong to local groups that work together only in emergencies. Many of these groups are affiliated with the National Electrical Contractors Association and secure confidential advice and help from its Labor Relations Committee. But the electrical contractor has not been particularly successful in his struggle with labor.

Lacking unity of purpose and action, he has been unable to resist the advancing labor drive. So he looks back on a history of concession and compromise, of disappointment and defeat. The union always wins. The employer always gives more money, shorter hours, better working conditions, for the sake of peace and profits.

Plus and Minus

It has been the same in every industry where labor is strongly organized. And to a considerable extent this has brought social progress and contributed to public welfare. And in the electrical construction industry these changes have come with a fortunate minimum of warfare and destruction. The union and the contractors have been wise enough to jointly establish our Council on Industrial Relations and write an arbitration clause into the agreements between local unions and employers.

But the unions still win. The contractors still fire and fall back. And out of all this a prevailing fear of labor is heavy in their hearts because the union has the power to stop any job or wreck any contractor's business by discriminating against him. Most employers act as though they were afraid of labor. The situation is so delicate that they dare not fight, nor even talk about it. Hence the tabu. Mention IBEW among electrical contractors and it is *"Hush! Hush!"* And, as I have said, the average employer would no more write his frank views on the labor problem in a letter, than he would set fire to his thumb. All right, let's take a look at this IBEW—What is it? What does it do?

The International Brotherhood of Electrical Workers occupies a modern office building in Washington, D. C. Here it carries on two kinds of business. It is national headquarters for the electrical unions of the building trade. It conducts a large insurance enterprise, with resources up in the big millions. It has many employees.

I would list the following as the principal contributions made by IBEW to the electrical construction industry—

1. It guides the policies of its local unions in their relations and negotiations with local employers. Jointly with NECA, it sponsors the Council on Industrial Relations to prevent strikes in our industry.
2. It serves as a clearing house for labor, shifting journeymen to points of shortage and making wiremen available to electrical contractors everywhere.
3. It guides the general policies for training apprentices in those cities, where locals conduct schools.
4. It provides a pension system that retires and partially supports the old timers when they are no longer efficient.
5. It has assumed the social responsibility for insuring the lives of its members.

"And how well does IBEW do these things?", somebody asks. It is a fair question. But I cannot answer it. IBEW certainly has a fine record in helping to prevent strikes. How well it functions as a labor supply is debatable and opinions differ and proven facts are few. Certainly apprentice training has been sorely neglected through the years of depression. But that was done deliberately to hold the work for present members. Was it fair to the construction industry? Again a matter of opinion. And IBEW is naturally working for its members. And are its pension and insurance services efficient and do they cost less than the services of independent insurance companies? I have not even tried to find out. For here again, that's their business.

But there comes a time when the policies and practices of a large labor organization like this, so affect the fortunes of the industry it serves and so concern the public interest that they no longer can be considered purely the member's business. I have three points in mind that I believe should be frankly charged against IBEW, as mistakes in management that have done great injury to the electrical construction business. Here they are—

1. IBEW has made the lamentable mistake of glorifying the hourly wage scale and causing its members to lose sight of the vital measure of their total yearly income. The result has been that in certain large cities where high wages are paid, the glitter of these high daily wages has attracted a surplus of labor. So the work is divided among too many and most wiremen can find employment only part of the time and average only a fair living wage. For example, in New York City where the scale is two dollars an hour, the average income of a journeyman is only $1500 or thereabouts. But meanwhile to support this idle army of men waiting for work, the cost of electrical construction is inflated to the point where the volume of work is reduced. And both the worker and the employer suffer.

2. IBEW has done great injury to the electrical construction industry—and to its members—by killing the incentive for better work. Men who are idle much of the time prolong their work in any way they can. And so there has been constant pressure to compel the use of those materials that require the most labor to install and to standardize workmanship on a plane of mediocrity. But men who do more and better work could be encouraged by being rated for higher pay. And men who do poor work and are laggards could be penalized by receiving lower wages. Then skill and ambition and industry would be recognized and rewarded. The union member would have greater opportunity. The construction industry would be immensely benefited.

A special "B" scale has been set up in some cities, notably Chicago and New

TOP MEN

D. W. TRACY *—for years International President, resigned last year to join the Government as Assistant Secretary of Labor. He still is Chairman of the IBEW International Executive Council.*

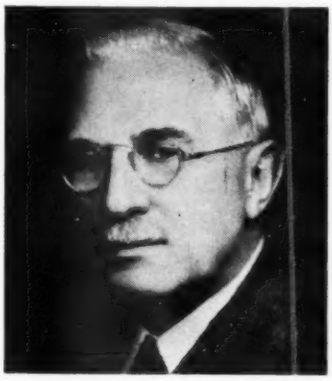
E. J. BROWN *—now president of IBEW, was the popular and successful local union leader in Milwaukee until last year. He is a member of the N.F.P.A. Electrical Committee.*

York, a lower wage paid to men engaged in maintenance, repairs, small extensions or other specified work. But this is provided not as a lesser wage for lesser competence, rather in the hope of stimulating a greater volume of classes of work that will not pay the higher scale.

3. IBEW has failed to adequately police the ethics of its local unions and prevent racketeering. And I doubt if any national labor organization ever has or

OF IBEW

M. H. HEDGES *—IBEW's director of research, who attends the conventions of the contractors and inspectors, throughout the country, and of the Electrical Committee, N.F.P.A.*



G. M. BUGNIAZET — *who edits IBEW's monthly publication* The Electrical Worker *and is a strong influence for tolerance and sound policy.*

can, where strong local leaders go wrong. Witness the long list of local labor scandals, in which local newspapers have recorded investigations and trials. Too often the evidence has disclosed extortionate charges on the public, financial exploitation of the membership, destructive warfare against the employer and other bad practices. And unfortunately in a number of cases the electrical union has featured in the bad news.

Now these are fair charges in my opinion, but it is only right to state also that these three weaknesses are no more chargeable to IBEW than to other unions. They are inherent weaknesses of leadership in the union as at present organized. And I would say that the national management of IBEW probably has sinned no more in these matters, and perhaps less than other large unions, insofar as my information and observations go.

Moreover, I believe that in those cases where certain large city local unions have gone into racketeering—and those cities come easily to mind—they have been out of control. It is a case of local leaders running wild. For the principles which the national officers of IBEW consistently profess and appear to practice, do not condone this sort of thing. I am thinking now of the four men who head the IBEW in Washington, and I believe they are sincere. The weakness in the system lies in the difficulty in securing local leaders who are wise and honest and capable enough to carry the responsibilities which local union leadership brings to men. This condition is the price paid for local autonomy.

And this, of course, is the universal problem of management. But it is particularly hard to find men for the local business agent's job who will fight for the employer's rights and interests as well as the employee's, and who can resist the temptations which the power of his job soon bring to him.

It is all a matter of human relations. Sit in on a case that comes before the Council on Industrial Relations and see the story unfold. Five men appointed by NECA and five men for IBEW sit in a club in Washington to hear testimony and give judgment. L. K. Comstock, ex-contractor, is chairman. M. H. Hedges, of IBEW, is secretary. You hear that the union and the contractors association in a city have fallen out and it is either to be arbitration or a strike. The local union presents a written brief on which probably it has had the help of IBEW headquarters. Its case is well supported by comparisons of rates and rules in other cities to prove its arguments. The local contractors also submit a written brief, which probably has been looked over by NECA headquarters and is supplied with data to support their contentions. The briefs are read. Then the business agent for the union in that city is heard and he describes conditions, their reasonable efforts to effect a settlement, their inability to come to terms with stubborn local contractors.

It is now time for the head of the local contractor's group to tell his story. But nobody appears. The contractors rarely appear to support their briefs. Perhaps they don't want to spend the time and money. Perhaps no local contractor is willing to stick his neck out by talking in public against the union. But it leaves the contractor's case weaker by that factor of personal explanation.

The picture is clear, however. You shut your eyes and listen and see two groups of men getting sore at each other over a series of irritating little things. One contractor feels that he can't get good men. Another appears to be unfair in the matter of paying board or travel expense to his men on out of town work. Grievances build up. Rules are changed. And the first thing you know, men on both sides are doing tricky things and acting mean. Then both sides get mad and, with a complete intolerance for the other fellow's natural point of view, they proceed to argue and bicker and threaten. Further negotiations, by give and take and the adjustment of demands, become impossible.

The local contractors are just as intolerant as the local union men, only the local business agent has the edge on them. He is backed by an organization that has been fighting this battle for years. His gang is solid for the three unwavering demands—more pay, less work, better working conditions. But the local contractors are amateurs at the game and they are competitors and they don't agree among themselves about a lot of it. They only agree in hating the union—which is a poor start for reorganizing cooperation.

Still Fire and Fall Back

And what does the Council do? It sees the picture plain and clear. It sets aside the bickering. It weighs the pros and cons, and after a few hours calm discussion, gives a decision. Probably it condemns and throws out some of the local rules that are unfair on both sides. It sustains the contractors in the local issues where they are right. It grants part of the wage increase demanded—not all of it. And that is probably all the local union expected to win, which was why they demanded more. So labor still wins and the local contractors accept what they could get and return as they must to the problems of their own business. In a word, again they fire and fall back.

Well, what's to be done? As I have said—this is a human relations problem—the hardest of all. The local wire-

men organize a union. They must have some one to run it, collect dues, stage meetings and represent them, while they are busy working with the tools. Naturally, they pick a man with union experience if possible. And then he is on the spot.

Every so often he is up on the carpet for re-election. What has he done to earn his pay? He must show service. How? The three cardinal objectives glitter before him—more pay, less work, better working conditions. He listens to grievances and goes to work on them. Some contractors he grows to like; some to dislike. He has the power to threaten and to punish. One employer gets good men; another doesn't. One employer is always in trouble; another isn't. It may be largely their own fault. But it takes a strong man in this union job to be entirely frank and fair. Many there are who meet the test. But there are many other locals who are not fortunate enough to find leaders of strength and judgment. And the members of the union suffer for it no less than the contractors.

For when jumpy men of small experience use power over other men, temper soon rules and tolerance flies out the window. And both sides are soon at loggerheads, with the members of the union too often the principal victims of the strife. Members of IBEW, as I have said, have been fortunate. There have been almost no strikes for twenty years. But, unfortunately, that does not mean peace and security for either labor or the employer in the electrical construction industry. As a matter of fact there is almost constant conflict and fear, as the undercover battle presses on.

To Cure These Ills

What can be done? Well, it seems to me much can be done, if it is done the right way. But it will not be easy. For what we are dealing with is America's next great problem. The organizing of human relations to develop more economic security and promote social progress, will engage the attention of the next few generations in America, just as the last few have been occupied with scientific invention and manufacturing production. It will concern all industry, all business. It confronts us now, we men of the electrical construction industry, in every city in the land. We can't escape it. We are already struggling with it, each man in his own way. And that's the trouble.

The first ordered progress will come, I believe, as electrical contractors begin to recognize that the wiremen—union labor—are just as much a part of the installation branch of this electrical industry as we are. And there are more of them. And they are better organized, more powerful in influence and more successful in their purposes. In a word, organized labor with its unity of action and its long experience in fighting for what it wants, has learned how to fight.

The employers of these wiremen have neither learned how to fight, how to negotiate nor how to improve their relationships with their employees to the point where education can begin to help the situation. The hope of the future lies in the realization of this fact and that other fact that the control of union action really lies in the power of the membership. There is a real opportunity, therefore, for cooperation between these two bodies, the membership of the local unions and the membership of the local contractors associations.

In the past, too often the average individual contractor has avoided contact with the union insofar as possible. He has been so afraid of trouble, that he won't even talk about it. And either to ingratiate himself with union officials or to show his pretended independence he has too often done foolish things that have really made bad feelings worse. And when a conflict comes, both sides are intolerant and selfish. And in such a set up, the contractor is licked before he starts, because he thinks and works as an individual and the union acts as an organization. But this need not be permanent—and for two reasons—

1. The contractor can also organize. He can develop an efficient union of his own, an association in each locality. But the purpose will be not to fight. The object will be to develop a greater facility for negotiations, a broader experience in coordinating with this other half of the electrical construction industry in that locality.

2. A closer relationship can be established with the membership of the unions for mutual education. I say it can be done, because I know that the rank and file of every union are honest, earnest, sensible men. They are the most skilled mechanics in the building trades. They have brains and judgment or they could not understand and operate under so technical and complicated a code of rules. And like all the rest of us, they are chiefly interested in steady work and security. They do not want to fight. They do not want to strike. They are normal Americans who want prosperity and progress—yes—but above all they want peace.

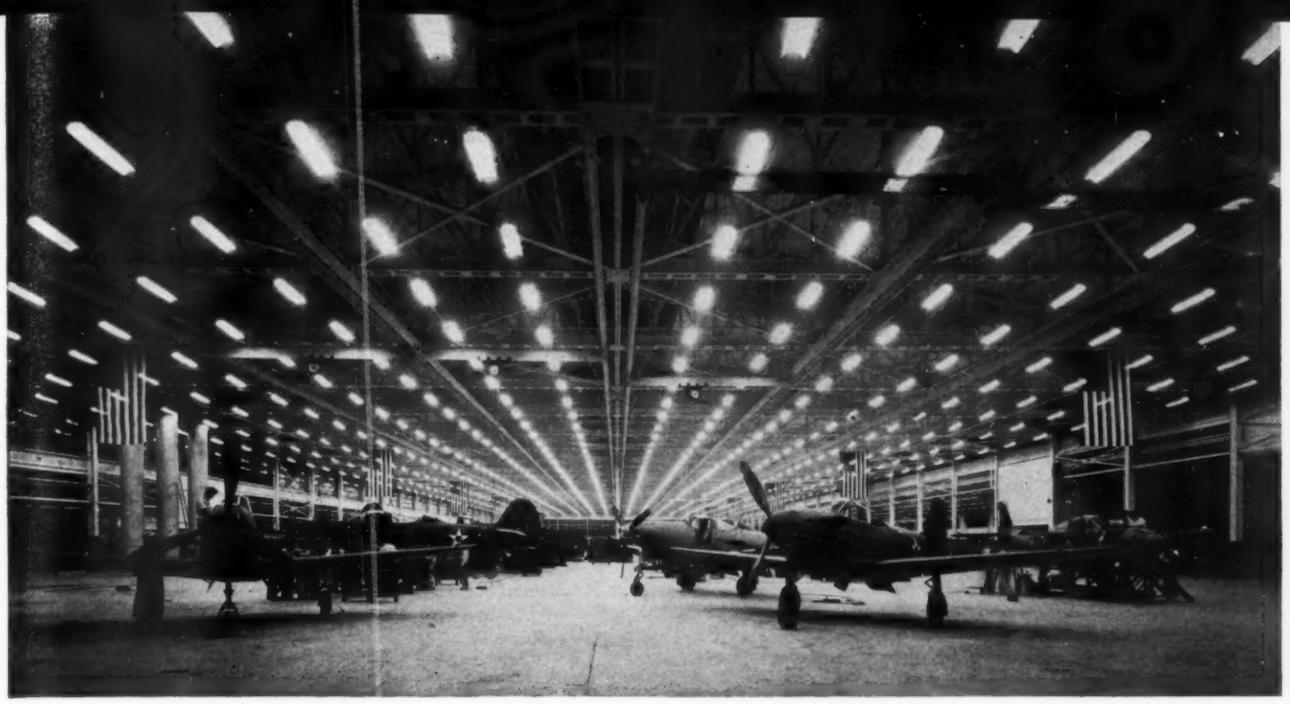
These men have the power to control their own unions. They do not always do so. They delegate the power to a manager, just as a contractor too often leaves the work of his local association to a secretary. And the hired man runs things his way. But the membership can be interested in a program that is made interesting. They can be aroused to self-assertion for their own advancement and defense, where action is needed. They can resist exploitation, where it is taking place. They can seize opportunities, where they desire to. And there are two directions in which cooperative work between the membership of a local contractors' group and the membership of a local union may be developed. This is in the discussion of the contractor's business and the discussion of the wireman's business—the affairs of our side of the electrical construction industry and the affairs of the union.

Contact and Understanding

What do I mean? That the employers group and the members of the union should meet together regularly and discuss the problems of management, opportunities to improve standards of craftsmanship, ways to reduce the cost of electrical construction by the use of better tools and better methods and how to create a greater market. For all these themes intimately concern the members of the union, only today they do not realize it. And it should be just as possible to organize mutual action toward such an objective as it has been to establish the Council on Industrial Relations and put a brake on strikes in this branch of the building industry. Such action might well start with shop meetings held each month by each contractor to keep his own men informed and develop greater loyalty within his own gang. Out of this can grow community meetings of the personnel of the installation branch of the electrical industry to discuss new equipment, costs, estimating practices and the whole spread of topics that are of such vital mutual interest.

Then out of this contact and understanding inevitably another good influence would develop. With a closer accord between the two groups, grown of acquaintance and confidence there would come a better spirit in the relations between the unions and the employer associations locally and nationally. It would be attended by a more active responsibility on the part of union members. And that would lead just naturally to the correction of

(Continued on page 52)



CONTINUOUS PRODUCTION *is maintained at the Niagara Falls assembly plant of the Bell Aircraft Corp., where new type R.F. high bay fluorescent units facilitate night time operations in the final assembly area.*

Light Speeds Aircraft Assembly

Fluorescent lighting for high bay areas increases night production in the new conveyorized assembly plant of the Bell Aircraft Corp., at Niagara Falls.

AIRACOBRAS for the United States Army Air Corps are now rolling off conveyorized production lines at Niagara Falls, N. Y. This is the new assembly plant recently designed and built by the Austin Company for the Bell Aircraft Corp.

Inside this modern daylight plant every facility has been provided for efficient workmanship and speedy handling of parts and sub-assemblies. This carries right through from receiving platforms to the hangar area where completed planes await inspection and flight tests.

One of the most important facilities, from the standpoint of both plant design and the maintenance of speedy production schedules, is the lighting system, both natural and artificial. For daytime work generous areas of side wall sash, monitors and skylights above the center bays provide an excellent distribution of natural light. This is controlled on the south and west by the use of Aklo glass. At night this natural illumination is matched by the most modern of fluorescent lighting systems. The interior walls and structural steel are painted white to attain the highest lighting efficiency possible.

The fluorescent lighting, installed by Ferguson Electric Company of Buffalo, consists of a new type of rectified fluorescent (R.F.) luminaire, specially developed by the General Electric Company for high bay illumination and used here for the first time. This luminaire contains a special circuit which rectifies the alternating current, so that a unidirectional current passes through the lamps. This smooths out the current wave and eliminates stroboscopic effect without any special balancing on circuits.

A total of 720 two-lamp units, each 200 watts, were installed in the high bay, final assembly area down the center of the plant. The fixtures are spaced on 12-foot centers and suspended 30 feet above the floor by special hangers which fasten to the roof purlins and are equipped with hooks which fit into looped bracket eyes on the fixtures. Each unit is plugged into a regular convenience outlet mounted on the purlins directly above it. There are four fixtures per circuit in the high bay area. The entire high bay fluorescent lighting system is designed to produce a minimum maintained illumination intensity of 30 foot-candles. Maintenance and servicing will be done from a rolling scaffold.

For sub-assembly work in two 50 foot bays on either side of the final assembly area, comparable lighting intensity is produced by two-tube Hygrade Sylvania regular fluorescent units mounted end-to-end in rows paralleling production lines. These units are mounted two feet apart and 12-ft., 5½-in. above the floor. The rows are on 16-ft. centers. On the south side of the building, where a future mezzanine will be built, these fixtures are mounted 19-ft., 6-in. above the floor.

This installation illustrates the possibilities of the extension of the fluorescent light source to high bay illumination in industrial plant applications. It also shows the importance placed on good lighting as an invaluable aid to speed production schedules.

ESTIMATING GUIDE

Check figures catch the gross errors of routine estimates and halter the roving decimal point. Easy to use units for these busy days.

By A. J. Allyn, *of Chicago.*

AVERAGED check units give the estimator a means of comparing his job estimate with average conditions. They detect gross errors, show up omissions and direct attention to those portions of the estimate that require special care in take-off and pricing. They must be broad enough to allow quick, easy checking yet sufficiently precise to give a reasonable guide to the accuracy of the estimate.

Good check figures are not rough guesses. They are based upon detailed estimating methods applied to average construction conditions, average conduit lengths and average materials. Because no single job is likely to be average, the detailed estimate will always vary above or below the check units. And, likewise, check units should not be used for the original estimates. An accuracy of plus or minus 15 per cent, quite adequate for checking, would be much too rough for estimating under today's margins.

The accompanying tables show the details considered in preparing check figures on branch circuit work in several styles of construction. The data are taken from an analysis of 213 jobs. Conduit lengths for outlets vary from 11.7- to 26-ft. with an overall average of 16-ft. per outlet.

Of the 16-ft., ½-in. conduit forms 80 per cent and ¾-in. conduit forms 20 per cent of the total branch circuit runs. Number 14 wire forms 75 per cent and number 12 wire forms 25 per cent of the total branch wire, and averages 2.7-ft. per foot of conduit. The variance per foot is noted under each heading.

The unit cost of concealed and exposed branch lighting circuits of heavy wall rigid conduit are noted under separate headings in each table. Detailed lists show the quantities of material and labor required for ceiling, wall, and floor outlets installed in several types of building construction. Material costs are noted and expressed in dollars.

The labor costs are expressed in man hours and include no supervision, lost time, or other items usually entered in estimates as a factor of the total labor. In all exposed branch lighting circuit units, the cost of the conduit support is included with the conduit materials and the cost of the support labor is included with the conduit labor. Each outlet or fitting is provided with an individual support which is additional to the conduit support.

The following paragraphs briefly describe the condition assumed under each heading;

1. *Ceiling Outlets in Concrete* includes the material required for installing a concrete ring, cover and stud in a 5-in. or thicker flat concrete slab. The labor cost for the ceiling box also includes labor for the threading of the unbent conduit terminals.

2. *Wall Outlet in Tile* lists the material required for installing a concealed switch or receptacle outlet in a terra-cotta or gypsum tile partition. The labor cost for this device box includes 1½ bends and 2 offsets in addition to the labor for conduit threading and the installation of the box cover.

3. *Wall Outlet in Concrete* lists the material required for installing a one gang adjustable floor box in a reinforced concrete slab. The labor cost for the floor box includes two bends and one offset in addition to the labor for the conduit threading.

POSTS

4. *Ceiling Outlet in Wood* lists the material required for installing a ceiling outlet in an unfurred lath and plaster ceiling on wood joists. The labor cost of the ceiling box includes two bends over the joists in addition to the labor for conduit threading, hanger, stud and plaster ring.

5. *Wall Outlet in Wood* lists the material required for installing a device outlet in a lath and plaster partition between the wood studs. The labor cost for the wall box includes one and one-half bends and two offsets in addition to the labor for conduit threading, hanger and switch cover.

6. *Floor Outlet in Wood* lists the material required for installing a non-adjustable box between the joists and supported by the sheath wood floor. The labor cost for the floor box includes two bends and one offset in addition to the labor for the conduit threading.

7. *Ceiling Outlet on Concrete* lists the material required for installing a "C" fitting, with an "L" fitting at every fourth outlet. The labor cost is based on running the conduit on a flat concrete ceiling, and the threading of the unbent conduit terminals is included with the box labor.

8. *Wall Outlet on Brick* lists the material required for installing a shallow type device fitting on a common brick wall. The box labor includes two bends in addition to the labor for threading the conduit terminals.

9. *Ceiling Outlet on Wood* lists the material required for installing an octagonal box with fixture stud. The labor cost is based on running the conduit on a flat wood ceiling or equivalent, and the box labor includes the offset conduit terminals.

10. *Wall Outlet on Wood* lists the material required for installing a handy box on a wood wall or column. The labor cost for the wall box includes two ceiling bends in addition to the labor for the two offset terminals.

All of the figures in the tables are based upon an average conduit length of 16-ft. per outlet. By dividing the total branch circuit conduit by the total number of outlets, the estimator will get the average for the particular job. The check units should be adjusted to the job average by means of the figures given under "add or deduct per foot".

DETAILED CHECK UNITS FOR OUTLETS

For concealed and exposed wiring in rigid steel galvanized conduit. Material prices are approximate. Labor is expressed in labor-hours. Average conduit length assumed at 16 feet for concealed, 18 feet for exposed circuits.

1 — IN CONCRETE CEILING

1	4x3½ Concrete Box		
1	4" Cover & Stud		
13′	½" Galv. Conduit		
3′	¾" Galv. Conduit		
3/2	½" LN & Bushings		
1/2	¾" LN & Bushings		
33′	#14 Wire		
12′	#12 Wire		
	Sundries		
Total Material		$1.66	Labor .76
Add or deduct per foot		$0.077	.03

2 — IN TILE WALL

1	4x4x1½ Box		
1	One gang cover		
13′	½" Galv. Conduit		
3′	¾" Galv. Conduit		
3/2	½" LN & Bushings		
1/2	¾" LN & Bushings		
33′	#14 Wire		
12′	#12 Wire		
	Sundries		
Total Material		$1.45	Labor 1.25
With Switch & Plate		$1.75	1.43
Add or deduct per foot		$0.077	.032

3 — IN CONCRETE FLOOR

1	Adjustable Box		
13′	½" Galv. Conduit		
3′	¾" Galv. Conduit		
3/2	½" LN & Bushings		
1/2	¾" LN & Bushings		
33′	#14 Wire		
12′	#12 Wire		
	Sundries		
Total Material		$4.57	Labor 1.47
With receptacle		$4.77	1.65
Add or deduct per foot		$0.077	.03

7 — ON CONCRETE CEILING

1	½" C Condulet		
1/4	½" L Condulet & Cvr		
1	½" One hole strap		
1	10/24 Lead Anchor		
14′	½" Galv. Conduit		
4′	¾" Galv. Conduit		
37′	#14 Wire		
13′	#12 Wire		
	Sundries		
Total Material		$1.86	Labor 1.43
Add or deduct per foot		$0.08	.052

8 — ON BRICK WALL

1	½" FS Condulet		
1	½" One hole strap		
1	10/24 Lead Anchor		
14′	½" Galv. Conduit		
4′	¾" Galv. Conduit		
37′	#14 Wire		
13′	#12 Wire		
	Sundries		
Total Material		$1.94	Labor 1.23
With Switch & Cover		$2.24	1.41
Add or deduct per foot		$0.08	.045

4 — IN WOOD CEILING

1	4x1½ Octagon Box		
1	Hanger & Stud		
1	4" Open Cover		
13′	½" Galv. Conduit		
3′	¾" Galv. Conduit		
3/2	½" LN & Bushings		
1/2	¾" LN & Bushings		
33′	#14 Wire		
12′	#12 Wire		
	Sundries		
Total Material		$1.49	Labor 1.02
Add or deduct per foot		$.077	.032

5 — IN WOOD WALL

1	4x4x1½ Box		
1	Hanger		
1	One gang cover		
13′	½" Galv. Conduit		
3′	¾" Galv. Conduit		
3/2	½" LN & Bushings		
1/2	¾" LN & Bushings		
33′	#14 Wire		
12′	#12 Wire		
	Sundries		
Total Material		$1.50	Labor 1.15
With Switch & Plate		$1.80	1.33
Add or deduct per foot		$0.077	.032

6 — IN WOOD FLOOR

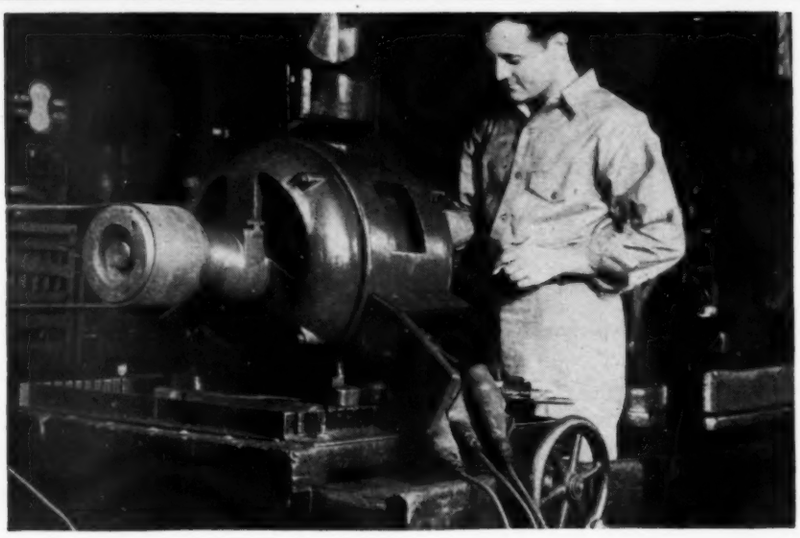
1	Non-adjustable Box		
13′	½" Galv. Conduit		
3′	¾" Galv. Conduit		
3/2	½" LN & Bushings		
1/2	¾" LN & Bushings		
33′	#14 Wire		
12′	#12 Wire		
	Sundries		
Total Material		$3.12	Labor 1.61
With receptacle		$3.32	1.79
Add or deduct per foot		$0.077	.032

9 — ON WOOD CEILING

1	4x1½ Octagon Box		
1	⅜" Stud		
1	#6 Screw ¾" long		
14′	½" Galv. Conduit		
4′	¾" Galv. Conduit		
3/2	½" LN & Bushings		
1/2	¾" LN & Bushings		
37′	#14 Wire		
13′	#12 Wire		
	Sundries		
Total Material		$1.62	Labor 1.10
Add or deduct per foot		$0.08	.04

10 — ON WOOD WALL

1	Handy Box		
1	#6 Screw ¾" long		
14′	½" Galv. Conduit		
4′	¾" Galv. Conduit		
3/2	½" LN & Bushings		
1/2	¾" LN & Bushings		
37′	#14 Wire		
13′	#12 Wire		
	Sundries		
Total Material		$1.58	Labor 1.18
With Switch & Cover		$1.88	1.36
Add or deduct per foot		$0.08	.04



INITIAL INSPECTION *of incoming machines reveals grounds, shorts and broken or missing parts. Repair estimate is based on this check-up.*

GROWLER TEST *reveals open bars in squirrel cage rotors. A drop of current in the growler coil, as shown by the ammeter, indicates a broken or open bar.*

Standardized Tests

Testing is an important tool for diagnosing motor troubles and as such the procedure should be alike in all motor repair shops. Here is a suggested list of standard tests for motor repair men.

By John E. Launder *Independent Electric Machinery Co., Kansas City, Mo.*

WHILE visiting various shops for information concerning motor shop test procedures, I came upon one striking answer to my question—"How do you start to find trouble when a job comes into your shop?" Surprising as it may seem that answer was—"I look at the motor where generally 90 per cent of the trouble is visible." To me, there is the key to a successful shop—observation, applied knowledge and experience, all supported by a well organized test procedure.

Most motor troubles are either visible or audible. So with a little application of thought to the job and a few supporting tests to check up your judgment after properly looking and listening you should be able to go right to the core of the trouble.

The motor shop employs tests to determine what is wrong with a job when it enters the shop and again to see that it lives up to its name-plate rating when it leaves the shop. Since tests are such an important and necessary phase of our work, they should all be standard and of a nature that can be easily understood by both layman and engineer. Standard instruments and methods should be employed.

With this goal in view, I have compiled and offer for the consideration of motor repair shops the following list of suggested standard tests and procedure for the diagnosis of motor troubles—

1. *Preliminary Checkup.* When a job enters the shop, make a general inspection of the entire machine without dismantling. If the motor is in running condition, give a low voltage ground test on the stator winding. If it is a slip ring machine, make this test also on the rotor winding. If the winding is clear of grounds and in a reasonably good condition, give the motor a running test starting at half voltage, then on full voltage to check for unbalanced or excessive current readings.

If you don't make a load test, make a locked rotor test at half voltage. This information with the running current usually gives a pretty good idea of the condition of the motor winding.

To eliminate all switching of leads at the instruments, a switchboard should be available that can be quickly changed from 5 to 100 amperes with intermediate scales of 10, 25 and 50 amperes; a 3-phase ammeter switch and a transformer for supplying 110-, 220-, and 440-volts.

2. *Check Bearings.* Always check the bearings for looseness and set a standard below which you will not allow the motor to leave the shop without telling the customer of the condition. Ordinary practice is to allow not more than 0.004-in. out for sizes up to 2-in. shaft diameter, and not more than 0.008-in. out for all over 2-in. shaft diameter.

3. *Check Rotors.* Always check rotors for balance. For unbalance can cause considerable bearing trouble and heating. With machines of speeds not exceeding 1800 r.p.m., static balancing can be used. With machines of greater speeds, dynamic balancing is preferred.

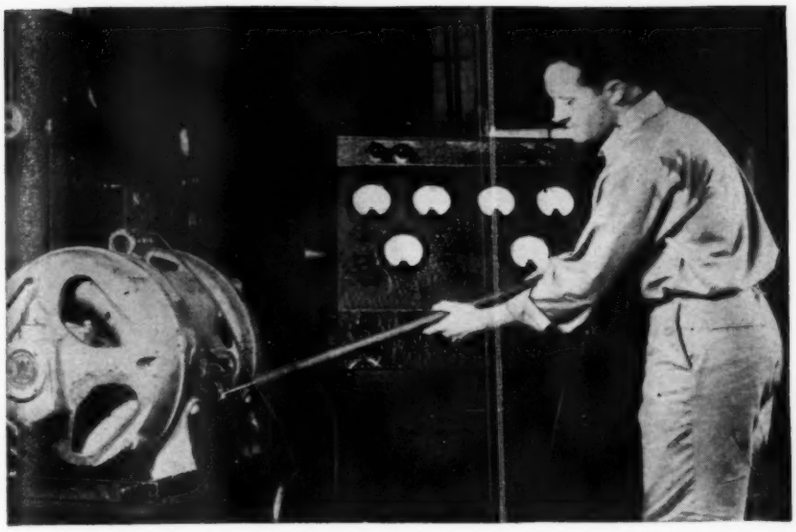
When extreme slip or lack of horsepower or torque is apparent, a test should be made for loose bars in the rotor or loose connections on the bars and end rings.

4. *Locked Rotor Test.* This can be used sometimes in place of a load test. Use half voltage and a prony brake. This test together with the running current gives a fair idea of what the motor condition is.

5. *Try Plugging.* This is one method of locating a condition of poor joints between rotor bars and end rings on squirrel cage rotors. Run the motor without load, then reverse it at full speed. A good rotor will stop almost immediately and accelerate rapidly in the new direction of rotation. A rotor with poor end connections will take appreciable time to come to a stop and will re-accelerate very slowly.

6. *The Growler Test.* This is another test for bad rotors. Apply a powerful

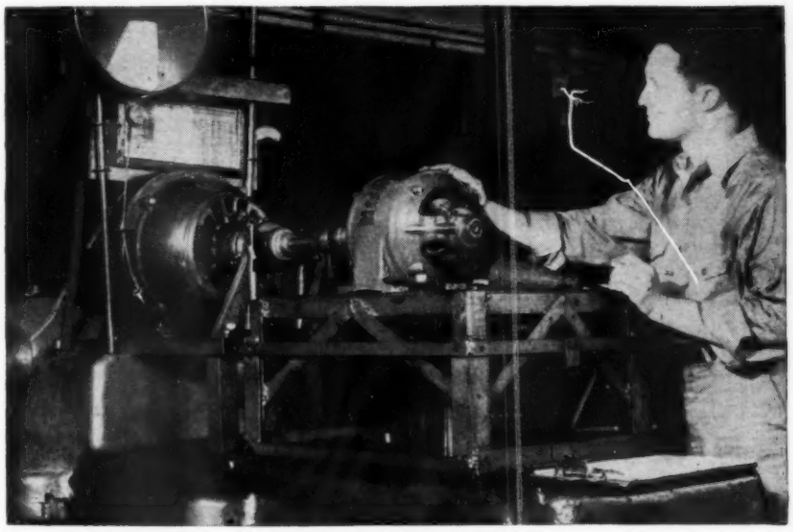
Abstract of a paper presented before the recent convention of the National Industrial Service Association in Buffalo.



GROUND TEST *using potentials up to 4400 volts is made by this portable shop analyzer. Equipment contains additional instruments to test other electrical devices.*

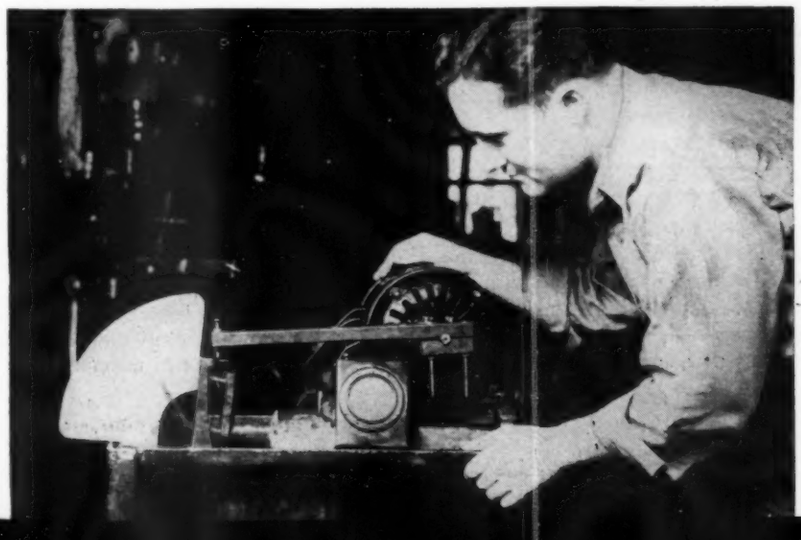
STATIC BALANCING *of rotors or armatures shows point of unbalance. Condition is corrected by adding solder on the band or inserting a capscrew.*

for Electrical Repairs



DYNAMOMETER TEST *determines full load of motor by just reading scale which is calibrated in horse power and r.p.m. as well as pounds. Takes motors from ½ to 5 h.p.*

TORQUE TEST *determines locked rotor torque in pounds, read on the scale; also the locked rotor current shown by the ammeter reading.*



growler to the rotor and use a thin piece of steel as a feeler over each slot. The slots with the bad bars can immediately be detected.

7. *The Torque Test.* This should be used on single-phase, fractional horse-power, repulsion-induction motors to insure a correct setting of the spring controlling the centrifugal device. If this device operates at too low or too high a speed, it may cause trouble on the job.

8. *Testing Stator Only.* If only the stator is received and the burn-out is not clearly visible, a megger can be used to locate grounded coils. If no megger is available, then an inside growler with a piece of thin steel as a vibrator can be used. However, a megger should be in every shop.

When alternating current stators are newly rewound, no testing is necessary until the phase groups are connected. Then a test is made to ground and between phase groups before dipping and baking and again after removal from the oven. After the motor is assembled, a no load running test is made and the balance of currents in each phase checked. Locked rotor currents are generally used when there has been a change in design or where there is some doubt as to the correctness of the winding as compared with standards on file.

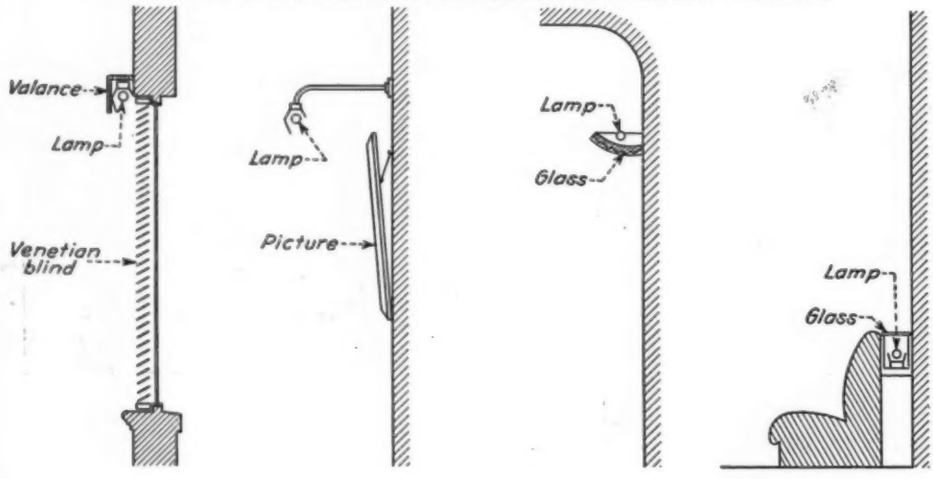
[Continued on Page 124]

Some Good Rules for Fluorescent Lighting

Guiding principles to follow in calculating requirements and in installing equipment. The last in a series of three articles to help the electrical contractor and industrial plant man in getting acquainted with fluorescent lamps.

OFFICE WORK *also bears heavier burdens with larger production. Here 2 watts per sq. ft. produce 30-40 foot-candles.*

STRUCTURAL DETAILS OF INSTALLING FLUORESCENT LAMPS



By S. G. Hibben

Director of Applied Lighting, Westinghouse Lamp Div., Bloomfield, N. J.

THE first lighting survey and recommendation of record was submitted to Mrs. James K. Polk in 1845. It covered the President's mansion in Washington. In the great East Room some 18 kerosene lamps replaced 150 tallow candles, thereby approximately doubling the intensities and cutting the daily lighting expense for this room from $8.75 to $2.11. In those days, the White House was lighted by 416 candles and when later the remarkable "coal-oil burners" were installed there were many who marveled. But those were the days of *fractional* foot-candles—not eye-comfort!

Lighting standards have advanced mightily since then! Another milestone was the first industrial lighting code of the I.E.S., 25 years ago. With considerable temerity this listed foot-candle recommendations on the order of 1.25 to 3.5.

Foot-Candle Levels

There were reasons for low foot-candle levels in those "B.C." years, (before candlepower). But these were reasons not based on the needs or habits of the human seeing machine. Rather the prohibitive restrictions of expense, of heat, of the glare of high candlepower sources and the shocking inadequacy of wire sizes that held us back.

These restrictions are now passing. This new era, ushered in with the fluorescent lamp, suggests modern foot-candle levels—

For General Occupancy	5 to 15 foot-candles
For Casual or Rough Work	15 to 30 foot-candles
For Critical Work and Merchandising	30 to 70 foot-candles
For Drafting, Inspection and Displays	70 to 150 foot-candles
For Color and Superior Critical Examination	150 to 300 foot-candles
For Special Display Presentations and Identifications	200 to 750 foot-candles

Primarily then the fluorescent lamp should be installed:

(A) Where present inadequate wiring forbids greater immediate wattage and where foot-candle levels can be approximately doubled.

(B) Where in offices we can secure on the order of 50 foot-candles without excessive heat or glare.

(C) Where in the factory a safe illuminant will diffuse a good work light over a wide area and will both raise intensities as well as soften shadows and achieve preferential colors.

(D) Where in stores for show cases, in cove lighting, and in color matching.

Some Good Rules

To the contractor, then, three great markets are opened—in offices, factories and stores, and of course, later will come residential service. But in this work there are some fundamental principles of good fluorescent practice that should be kept in mind. These include:

1. *Adequate Initial Intensities.* Install enough wattage or useful lumens at first to satisfy present demands and

RETAIL TRADE IS *also speeded up now-a-days and competition freshens. Install fluorescent lighting, with lamps shielded or out of direct view.*

IN INDUSTRY *today the need is for 24 hour seeing comfort and fluorescent lighting offers new possibilities and adaptations to help speed production.*

anticipate the needs of a year or two hence. In the past when more light was wanted it was simple to replace a 60 watt with a 75 watt or a 100 watt with a 200 watt filament lamp. Now, however, the fluorescent fixture is limited to its chosen size of lamp. More lighting can be secured only by later installing more or bigger fixtures. Moreover, with small wattage fluorescent units, the fixture cost per useful lumen is relatively high and the customer's dollar is better invested if he plans on a basis of future adequacy.

2. *Avoid Bare Lamps in Continuously Occupied Spaces.* True, the brightness of the exposed fluorescent lamp averages only about four candles per square inch, equaling the brightness of a fairly large diffusing glass globe. Nevertheless any such sources continuously in the field of view are bound to be uncomfortable. Also, bare lamps will produce reflected images in polished furniture and shining surroundings, thus aggravating the glare. Do not try to "get rich quick" by installing "tinny" exposed lamp luminaires. Don't let the darkened ends of old lamps make the installation unsightly.

Follow in general the established good practise of semi-direct or shielded direct lighting. Use louvers, lightly diffusing glassware or diffusing plastics. Do not forget that fluorescent tubes will accumulate coatings of dust and should be accessible for cleaning.

3. *Avoid Fluorescent Lamps in Open Reflectors Close to Materials that Fade.* High intensities of filament lamp lighting as well as of fluorescent lighting will fade transient dyes. While no short wave ultra-violet escapes from the fluorescent lamp to especially cause fading, and its lesser radiant heat is also in its favor, yet high foot-candle light on the goods carries with it a corresponding hazard of fading.

In show cases where lamps and goods are close there is little to be done, except to avoid leaving dyed fabrics for long periods near the lamps. The merchant should change displays frequently. No illuminant will counteract defects in dyes.

4. *Choose the Proper Color Fluorescent for the Job.* When these lamps were first introduced, the color of the whites and near whites was evaluated on the basis of a "black body", as carbon, heated to high temperatures. The temperature measurement is known as degrees Kelvin—abbreviated K. Since zero degrees on the absolute scale is at minus 273°C, the color temperature that is stamped on the fluorescent lamp bulb is really that figure of centrigrade temperature plus 273°C. At this point a piece of hot carbon would have an incandescent color similar to the lamp.

Roughly the color temperature equivalents of the fluorescent lamps are about as follows:

FLUORESCENT COLOR TEMPERATURE EQUIVALENTS (APPROX.)

*Industrial White	8000°K
Daylight	6500°K
Soft White	4000°K
White	3500°K
Warm White	2800°K

** For the special R.F. type only.*

With the exception of daylight and white lamps, colors can not be very accurately stated in color temperature equivalents.

The special so-called "warm white" lamp of 2800°K has proved less desirable for most commercial applications than a whiter color of the present "white" lamp at 3500°K. However, the latter color soon proved unsuited to food stuffs in groceries and especially in restaurants and so more recently there appeared the "soft white" lamp. It is generally a mixture of daylight and pink color and is kind to the complexion, to many displays of intimate wearing apparel and to cooked foods.

5. *Daylight Lamp Is Not for All-Purpose Lighting.* The daylight fluorescent lamp is a reasonably close approach to outdoor noon daylight color. But the latter will vary considerably and there is no universal color that a daylight fluorescent lamp exactly matches. This lamp is perfectly satisfactory for bringing out fabric colors about as they would appear on the street. But daylight lamps should not be depended upon for scientifically exact color matching as basic standards in industry. For glassware or silver, yes. For flowers, show windows, general store areas—maybe. For restaurants, beauty parlors, residences,—no.

6. *Be Careful of Cove Mounting.* Fluorescent lamps mounted end to end as in a concealed cove have blank spaces equal only to the double width of a socket, yet this gap often causes dark spots on the plaster or the reflecting surface above. This may be avoided by

[Continued on page 73]

ENTRANCE FLOODS, *1,000 watts each, light the roadway and ticket building. Reflectors may be tilted back for relamping from the roof.*

SEATING LIGHTS *are suspended from the roof truss. Slope of roof and rising tiers of seats permit convenient ladder work along the sides. Center lights are worked from catwalks.*

Lighting a Stock Show

Where prize steers vie for ribbons in Ft. Worth's famous Coliseum, the Hensley Electric Co. provided high intensity lighting arranged for convenient control and maintenance

IN relighting the Ft. Worth Coliseum for the annual exposition and stock show the Hensley Electric Co. of Ft. Worth employed an effective method of lighting, from a high ceiling, installed without scaffolding or high ladder work. This layout designed by Richard K. Werner, consulting engineer of Ft. Worth, grouped the main elements of the lighting system close to catwalks under the monitor roof.

Most of the high work in installing the reflectors and running the wiring circuit was handled directly from the catwalk. In use, the reflectors can be serviced, relamped and focused readily. Adjustable mountings permit directing the beam to any part of the Coliseum floor for special effects. Thus, the main lighting can be handled from the catwalk in the same way as theatre lighting is handled from a stage gridiron.

From the existing switchboard in the Automobile Building, a four inch conduit containing three 600,000 cm. and one 200,000 cm. cables was extended through the attic of the Merchant & Exchange Building. Then it dropped underground under the roadway in lead covered cable to the main distribution panel located under the seating space at the northwest corner of the building. A feeder extends under the seating space, up to a roof truss and follows the truss to the main lighting control cabinet located on the high catwalk. The circuit was run in 2½-in. conduit and contained three 400,000 cm. and a No. 0 neutral. This cabinet operates 45 lighting circuits, feeding main area lights and lighting over the spectator space.

Twelve contactors and associated remote control circuits are provided for operating the lighting. A remote control line of 1¼-in. conduit with twelve No. 12 wires and one No. 10 is brought down from the main lighting cabinet to a remote control station in front of the band shell at north side of building.

Circuits for the lighting are extended in electrical metallic tubing from the distribution panel along the catwalk. At each fixture bracket a fitting was installed to take a flexible lead from the fixture. Sufficient slack is left in the connecting cable to permit rotating the reflector through 180 deg. to permit relamping from above.

Catwalk Lighting

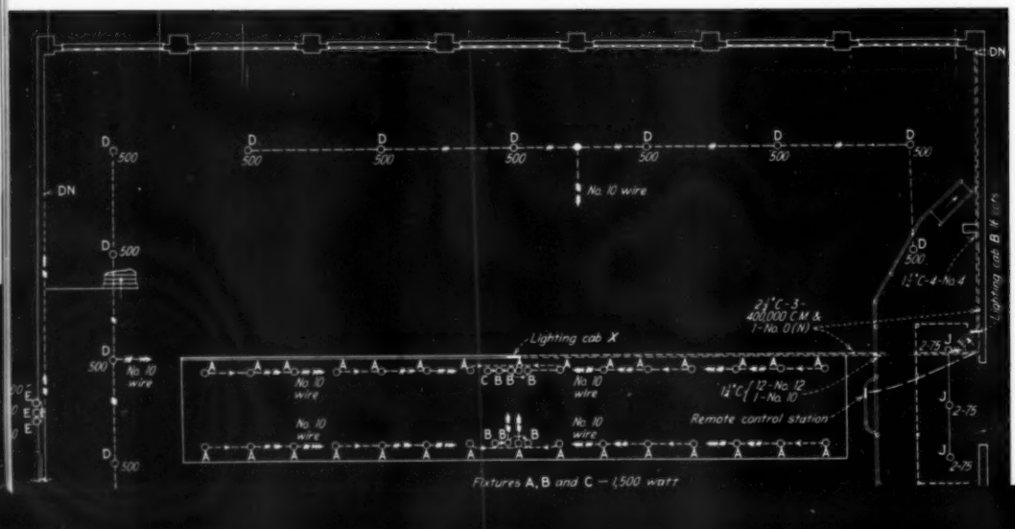
Along the catwalk there are two rows of reflectors, 15 in each row. Each reflector is equipped with a 1500 watt lamp, fed with No. 12 and No. 10 wire 3 phase, 4 wire circuits. At the center of the arena there are seven additional reflectors of the same size grouped closely together. Lighting over the seating area consists of six 500 watt reflectors on three sides of the arena and two at the north, where the stands are broken by the band shell.

The latter circuits are wired with No. 10, feeding two 500 watt lamps on a circuit. These are controlled, like the arena lights, from the main lighting panel by remote operated contactors.

Over the entrance a group of three 1,000 watt floodlights was installed and a similar group mounted on the ticket building facing the front of the Coliseum. This provides an attractive floodlighting installation for the face of the building and the space between. Mounted at a decorative roof parapet, the outdoor floodlights are arranged so that they may be tilted back to permit relamping from the roof.

Lighting in the offices and in the space under the stands is conventional. But, because of the long runs, No. 10 wire was used to keep down voltage loss. A feeder of three No. 4/0 and one No. 1 in 2½-in. conduit feeds the two lighting panels for the space below the seats and the lighting panel in the ticket office. A lighting panel with four No. 4's handles the band shell circuits.

SHOW LIGHTING *is handled from two center rows of 1,500-watt reflectors operated by remote control. Wires feeding end circuits are No. 10. Three 1,500 watt reflectors are balanced on each three-phase, four-wire circuit.*



Turning up a vast rich market for you ... Cutler-Hammer MULTI-BREAKER advertising.

Doing the spade work ... turning up ripe prospects ... dropping them in your lap—that's the job Cutler-Hammer Multi-Breaker advertising, appearing in *all* major home-building and modernization magazines, is doing for contractors, wholesalers, and builders. Hand in hand, the interest these leading magazines create and the sound, forthright selling job done by Cutler-Hammer advertising are making the Cutler-Hammer Multi-Breaker the leader in this field. How much of the harvest will *you* reap? How can *you* profit by the Cutler-Hammer campaign? Carry, feature and push the Cutler-Hammer Multi-Breaker line and you will have a highly satisfactory answer to these questions. CUTLER-HAMMER, Inc., 1306 St. Paul Avenue, Milwaukee, Wisconsin. *Associate* Canadian Cutler-Hammer, Ltd., Toronto.

CUTLER-HAMMER
MULTI-BREAKER
C-H

"I Really Keep Labor Costs Down
WHEN I INSTALL DAY-BRITE FIXTURES"

"Like most contractors, I watch my costs. And — I know that LABOR IS ALWAYS A BIG ITEM. So — anything that cuts installation costs is good news to me. And, it's good for my customers, too — when a manufacturer designs his product for quick and easy installation, he's bound to design it for quality and performance as well . . . And, that's only one of the many reasons why I always recommend Day-Brite — the Fluorescent Fixtures that *cut labor costs and build customer confidence.*"

Here's One of the *Easiest* Fixtures to Install and Service - - - - -

THE DAY-BRITE TROFFER

INSTALLATION IS SIMPLE . . . Each Day-Brite Troffer is a complete, self-contained unit. It is installed as one piece. There are no loose parts, no brackets, no accessories of any kind to hold onto while it is snapped into place! In metal-pan acoustical ceilings, Day-Brite Troffers snap into the Tee-Bar mounting rail which also supports the ceiling blocks. For installation in other types of ceilings — acoustical blocks, board, plaster — Day-Brite Troffers can be provided with flanges for quick attachment to wood or metal grounds.

Cut-away section illustrating standard snap-in Day-Brite Troffer, installed in metal-pan acoustical ceiling.

QUICKLY ACCESSIBLE . . . Here's another "simplicity" feature! At the left is illustrated a cross section of a Day-Brite Troffer showing one-piece housing and wireway cover. Note in the cross section at the right that the one-piece housing and wireway cover has been dropped, simply by removing 2 screws at each end — thus making the entire wiring channel instantly and easily accessible.

NATIONALLY DISTRIBUTED BY ALL LEADING ELECTRICAL SUPPLY HOUSES

Day Brite Fluorescent

Editorials

Earl Whitehorne, Editor

Don't Buck Priorities

A lot of men concerned with industry are piling up trouble for themselves right now. They are indifferent or even hostile to the priorities program. They resent requests for information coming to them from suppliers. They think they are too busy and are not yet trying to help. And the first thing you know, they won't be able to buy what they want.

What then, brothers?

Lack of motors, pumps, hoists, or parts of any of them or copper wire or bolts can shut down a factory. It may be the responsibility of an industrial electrical contractor, a plant chief electrician or a motor shop man to supply them. But as the pinch tightens, if he is not right with the system as it is set up, such a man with the best rights and intentions in the world may find himself helpless. Because he has not gone through the procedure for qualifying his needs, he may tangle up his whole business.

We've got to look it in the face! Soon practically all products manufactured for stock and resale will be under priority restrictions. To conserve materials and labor and warehouse and car space, the quantity produced will be held down to actual needs and these needs will be calculated on data recorded in advance. If you have not reported your need, there will be a deficiency, and what there is somebody else will get.

What must you do? Do this! Identify your orders for items that will be used for defense work. As the basis for this find out from every customer the per cent of their sales that are for defense. That is the way it is being organized. That is the way to handle it. Then give a priority rating for everything you buy from wholesaler or manufacturer.

This may be a nuisance to you. Some of your customers may still balk and bicker. But they will learn that it is worth more than this to live and work in America.

Meanwhile protect yourself. Supply your customers with standard forms of affidavit prepared by the Priorities Division of OPM. Identify your defense orders. Report what per cent of your sales goes into defense channels. Get all the help you are entitled to by helping make the system work. And this is something to be done today.

"Repair for Defense"

The Federal Housing Administration is now building better than 5000 small houses a week. Since the first of the year about 125,000 have been started. They are scattered over the country, largely in areas important to defense production.

Now comes a supporting drive to convert old residences into multi-family dwellings or rooming or boarding houses. It is a sensible short cut to additional defense housing. It will start this month backed by builders, contractors, banks and material manufacturers and dealers throughout the country. It will be modeled after previous successful campaigns in the building industry.

Here is another vast market for wiring, that should have the attention of the entire electrical industry immediately. The F.H.A. is preparing on a scale that will bring results, and electrical contractors in every city should be in touch and ready to tie into it. This wiring should be done properly and adequately and on a basis that will pay a profit. The work, if properly handled, may lead into that general rewiring program for which we wait.

When They Buy Fluorescents

In a recent checkup of a hundred stores that have installed fluorescent lighting the following facts were developed—

54 bought because the merchants saw the new light in other stores and liked it.
16 heard they could save money and wanted to.
24 bought from local dealers.
18 bought from friends.
16 bought from local bidders.
71 did not know the name of the lighting unit they had installed.

So competition continues the chief motive in store improvement. Cost is a minor factor—say what you will. And the surprise is, how little the seller is impressing the buyer with the name, reputation and superiority of the unit itself. And this shows a weakness in anybody's selling.

Down Distribution

The roof top transformer vault, with secondary distribution downward through the building is familiar in industry. It is now gaining more consideration in commercial structures, especially department stores.

The construction manager of a nation-wide retailing concern reported at a recent power meeting that the main power load is now on the roof level, including fan motor, cooling machines and elevators. As the lighting load is practically uniform, the load center approaches the roof.

This brings a few complications in wiring. For instance, where there is a concrete enclosed primary feeder and a hoisting problem on the transformer. But such inverted wiring systems should offer no serious installation difficulties.

Interest In Wiring

All men concerned with electric wiring owe the National Adequate Wiring Bureau a lot of thanks. They have done a fine job with the national home magazines in arousing popular interest in wiring, as a vital factor

in the use of everything electrical.

A recent bulletin sent out to local AW Bureaus encloses reprints of many articles of this type. They are refreshing. For they make a household theme of the dry subject of wiring in a way that electrical men would not have believed possible. Also, they show keen interest among the architectural papers and a new desire to take advantage of better planning in the wiring provisions for all types of buildings.

Out of all this will come a public acceptance of wiring as a factor important to owners. For people who live in homes are the same men and women who own and run business properties also.

Watch Out

The F.B.I. is asking for help in curbing the work of spies and saboteurs in industry. The danger is very real, they say.

The first preventive step for every electrical contractor, every plant maintenance manager and every motor repair shop to take, of course, is to hand-pick its own men. Employ no one you cannot vouch for. Send no one to any customer whom you do not know you can trust.

There are a lot of good craftsmen in America who have been poisoned and are not safe. Watch out for them. And when you find one notify the F.B.I. at once. J. Edgar Hoover needs your help.

Noble Restraint

Shortly after the French Revolution, J. Walter Collins of Chicago started pleading for a common sense apprenticeship plan to keep skilled men flowing into the industry. He has been at it ever since.

Now he is daily surrounded by contractors in trouble. Questions about skilled labor come from every side. Where are the men going to come from for jobs now being figured? And Walter does not say—"I told you so."

Tell 'Em Who To Call

We are interested in local newspaper ads by electrical contractors. They are so few that they stick out. Yet everybody in every community uses electricity, needs a small wiring job, or something repaired. Most of them just don't know who to call and so just let it go.

Modest, economical, effective local advertising can be made to pay. It pays in two ways—1. In orders; 2. In new contacts that become new customers for residential, commercial and industrial work.

Back Talk

The R. C. Wire Tangle

To the Editor—"Well, well, What do you mean, 'Tangle'? Just because a few fellows looked at a few pages of tables in the 1940 Code in place of a single table of carrying capacities and were too lazy to take a pencil and a small amount of brains and start a *little* figuring?

"The new tables are not really formidable, they only look so. The new tables of carrying capacities in the 1940 Code are tables of good engineering practice, based on engineering data gathered by quite a few years of exhaustive tests by competent engineers. They are tables which cannot and *must not* be destroyed. They supersede a table of obsolete carrying capacities which are proven unsafe.

"You say that they are complicated. Why? Only because one doesn't take the time to study them. You say that Boston repudiated them. But Boston admits that it made an error and that there is no rhyme nor reason nor engineering to their haywire table. I don't know the Detroit excuse. Plenty of contractors have found them workable and very useful. Plenty of inspectors do not condemn them. Maybe a few did.

"Simplification of the line is simple and no Code action is necessary. Let the manufacturers produce wires with Type R insulation for sizes No. 14 to No. 8 and with Type RH insulation for sizes No. 6 to No. 0 and with Type RP insulation for sizes No. 00 to 500,000 C. M. inclusive. Then those who want to go by the old (1939) table can do so and they will be safe and sane and those who want to go by the 1940 table can do so and also be safe. We would all be happy and won't have to wait for any long winded or long delaying Code revisions to take care of it."

F. N. M. Squires
Chief Inspector
New York Board of Fire Underwriters

Maybe that is the way to simplify the wire line. The manufacturer must decide. But as to the Code, here we have a simple old fashioned difference of opinion. Squires says the new code tables are simple. But a lot of people across the country don't agree. Our point is that if enough people think the new wire rules are too complex, they ought to be simplified or the code and the electrical construction industry will suffer.

No man knows the Code better than Fred Squires. We defer to him in all matters of interpretation in his "Questions on the Code" department. But our editorial opinion in a case like this is our own. So we publish this letter to show that he is in nowise chargeable should we make an error in judgment. Sometimes he may not agree with us at all. His opinion is also his own.

Wire Line Simplification

To the Editor—"Action of *Electrical Contracting* in calling attention to the need for a simplification of the building wire line and of the Code governing it has been a patriotic service. Reducing the number of types of wire now being manufactured will release vast stores of copper and rubber now tied up in inventories. It will conserve raw materials in future manufacture. It will avoid needless duplication of stock, and it will materially reduce shipping costs.

"For the sake of national defense alone, therefore, the matter becomes urgent and vital, but to this must be added the benefits that will accrue to the industry itself from such a move. Simple, easily understandable rules in the rubber-covered wire section will avoid a great deal of confusion, and add to the stature of the Code itself. There remains only the problem of how to bring this simplification about immediately.

"We suggest that a new style of wire be added that meets the minimum requirements of the Code, this to replace the many other types. This should achieve the desired result at once. As a wire manufacturer, we stand ready to cooperate in any possible way, both for national defense and the good of the industry."

C. W. Higbee
Manager Wire Sales
United States Rubber Co.
New York, N. Y.

We believe all the wire manufacturers will gladly cooperate to reduce the present burden of excess and duplicating varieties of building wire. At this time the present wastes are indefensible.

Whether or not simplification should be accomplished by adding a new wire, we are not concerned. Let the manufacturers work out a procedure to serve the best interests of the industry and the public. It can be done. It should be done quickly.

The "Wire" Tangle

To the Editor—"Your editorial on 'The R. C. Wire Tangle' in the July issue of *Electrical Contracting* certainly is in plain English language and hits the nail directly on the head. It is most unfortunate that the N. F. P. A. Electrical Committee did not see fit to take action on this important matter at the interim revision sessions held in June.

"Although the City of Elizabeth has, for the past twenty years, adopted and used the various issues of the National Electrical Code as a guide and standard for the local regulations, we too, have hesitated to go along with the 1940 edition because of the drastic changes in the wire sections."

George H. Schardien
Chief Electrical Inspector
City of Elizabeth, N. J.

Thank you, Mr. Schardien, for your commendation. Here is still another case of the kind that has disturbed us. When cities question a revision of the Code it is a blow to its authority as a national standard, and something should be done to bring speedy relief—we think.

A 50 Foot Candler

To the Editor—"In line with the fine work you have been doing in behalf of lighting, through the pages of your publication, we are pleased to send to you herewith certificate of membership in the Miller organized '50 Foot Candler Club.'

"The object of this club is the advancement of better seeing conditions in the industrial and commercial field of the country through the organization into one vast cooperative force of all groups and individuals interested in the creation, production, distribution and use of light sources and lighting equipment, providing a minimum of 50 foot-candles of general illumination."

H. L. Harrison
Director of Advertising
The Miller Company
Meriden, Connecticut

And thanks to you! Fifty foot-candles is a worthy object and we'll all be there some day. We wonder how much closer we would be right now if Edison had made his first lamp a 50 foot-candle gleamer instead of establishing 16 candle power as the standard.

WIRING Methods

SOLDERLESS SWITCHBOARD CONNECTIONS

Solderless connections without the use of auxiliary lugs, was a labor saving feature of a switchboard recently installed by the Lord Electric Company, New York City. The switchboard was delivered with the lugs mounted on the branch circuit busses. All the mechanic had to do was skin the conductor, insert it in the connector and tighten up two bolts.

The connectors are constructed of a solid block of copper grooved to receive the conductors and mounted to the busses by stud bolts. The compression plate on the connector has two bolts

***SOLDERLESS CONNECTORS** mounted directly on the switchboard busses eliminate need for auxiliary lugs and effect a saving in installation labor.*

which, when tightened up, grip the conductor firmly to make a 100 per cent contact, vibration resistant connection.

All the busses are covered with asbestos sleeving up to the point of support on the switchboard framework.

EXPLOSION PROOF DEVICES

Dissatisfaction with conventional explosion proof devices for highly polished operating rooms caused a number of changes in the specifications on the

***COMPACT DEVICES** designed for use in hospital operating rooms have working parts enclosed in explosion resisting cases. Plug receptacle, one, two and three gang switches are shown.*

Charity Hospital in New Orleans. Eventually, with the cooperation of the Nola Electric Co., electrical contractors, and fitting manufacturers, several new designs in hospital operating room wiring devices were used.

The new switches and plug receptacles are designed to fit into conventional box outlets. Operating parts are sealed to withstand internal explosions without igniting surrounding vapors. Appearance has been enhanced by compact assembly and attractive design and finish.

WRENCH SIZE

Several times I have seen the "kink" in print which shows how to make a wrench longer by "slipping a gas pipe over the handle." It is a very simple procedure and it may look and sound good to some electricians. But I don't believe in making a wrench longer in order to put nuts on tighter.

Wrenches for small nuts are invariably short. For medium nuts they are medium in length; and for large nuts, they are long. The manufacturers, therefore, seem to have some "system" in making wrench lengths. The pitch of the thread is considered, the cross-sectional area of the bolt at the bottom of the threads is considered, and the strength of the average man who does the tightening is also considered.

To make a wrench "twice as long" you increase the tension on the bolts to twice the amount, the force of pull on the wrench being the same. By increasing wrench lengths, I have frequently "stretched" bolts until they broke in two, or I stopped turning as soon as I felt the bolt begin to stretch. This is poor practice, and I do not do it any more. I do not increase the wrench's length because I realize that the elastic limit of a bolt should in no case ever be reached.

If you feel like making a wrench longer for "unscrewing" a nut—all right. But don't make it longer for tightening. You may thereby ruin some valuable electrical machinery and may even cause a serious accident.

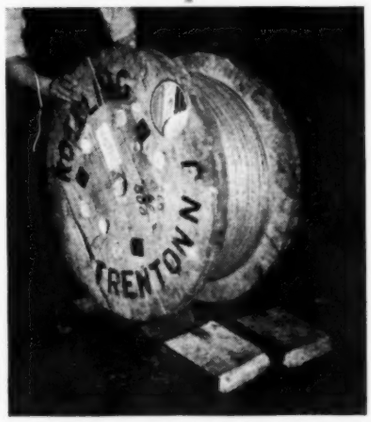
By W. F. Schaphorst, Newark, N. J.

ROLL-ON REEL JACKS

Rollers replace spindles and jacks for supporting heavy reels in an ingenious device used by the Harlan Electric Company of Detroit.

Two 3½-inch rollers, similar to those used on roll conveyors, are mounted 15-inches apart in a sturdy welded angle iron frame. A heavy block of wood, 12-inches wide and 2-inches thick, beveled at one end forms an approach.

In use, two of the reel holders are set on the floor far enough apart so that the sides of the reel will come approximately in the center of each. By rocking the reel, it is rolled up on the



***REEL ROLLERS** eliminate lifting and speed cable pulling set-ups. Two roller blocks are used for each reel. One man can easily set up reels of the size shown.*

Avoid Line Voltage Surges

in defense industry lighting and machine controls. Specify SOLA

CONSTANT VOLTAGE TRANSFORMERS

CHECK BULLETINS IN WHICH YOU ARE INTERESTED.

TRANSFORMERS for:

- ☐ Constant Voltage JCV-74
- ☐ Power and Control JPC-14
- ☐ Fluor. Lighting JFL-86
- ☐ Bells and Chimes JBC-52
- ☐ Mercury Lamps JMV-76
- ☐ Luminous tube JLT-67

NAME .....

ADDRESS .....

SOLA ELECTRIC COMPANY

2525 Clybourn Ave. **Chicago, Ill.**

WIRING Methods

[FROM PAGE 34]

approach block and dropped between the rollers. The reel will then roll freely and safely for any ordinary speed of pulling.

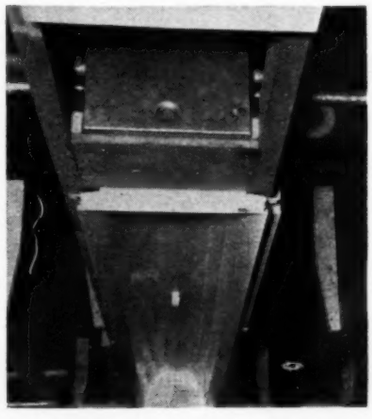
To remove the reel, the mechanic steps on one roller and easily rocks the reel back down the approach to the floor. It is unnecessary to lift the reel at any time. Four-foot loaded reels can be easily set up by one man. Reels of any commercial size can be handled on this device.

The roller blocks weigh approximately 20 lb. each and are very compact. They are rugged enough for extremely rough service and stack conveniently in storage.

ENCLOSURE FOR LAMP AUXILIARIES

In a recent fluorescent lighting installation at Elizabeth, N. J., Buhl & Caffrey, electrical contractors of Newark, N. J., installed the auxiliary equipment in individual enclosures adjacent to the fixtures.

This was necessary because these open reflector type of fixtures were mounted flush in a hung ceiling and there was no other means of gaining access to the auxiliary units. The fixtures were mounted in continuous rows



ACCESSIBLE ENCLOSURES house the auxiliary equipment for flush mounted open type fluorescent troughs in this office installation. One enclosure serves two double lamp units.

across the room with about 24-inches between the ends of adjacent troughs. The majority of the fixtures were of the two lamp type with the 40-watt lamps mounted in tandem fashion.

An ordinary hinged-cover steel box, mounted on end, was installed in the intervening space between the ends of

WIRING Methods

[FROM PAGE 36]

the fixtures. Housed in these boxes were two sets of two-lamp auxiliaries and starting compensators serving two dual-lamp fixtures. Two No. 10 rubber covered wires in ¾-inch flexible conduit connected the troughs to these enclosures. The boxes are interconnected with ¾-inch conduit. A removable section of acoustical tile covers the access opening in the ceiling.

MULTIPLE OUTLETS FOR ASSEMBLY TABLES

Workers in the assembly department of the F. W. Sickles & Co., radio parts manufacturers of Chicopee, Mass., sit at both sides of the long assembly tables.

To provide adequate receptacles for the large number of soldering irons,

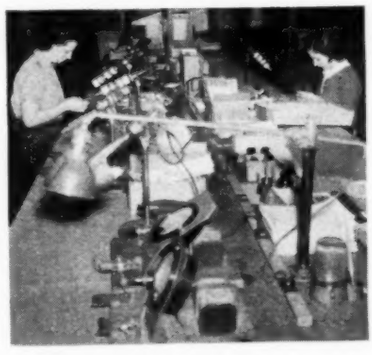


TABLE OUTLETS run in Plugmold down center of assembly table provides connections for portable electrical equipment.

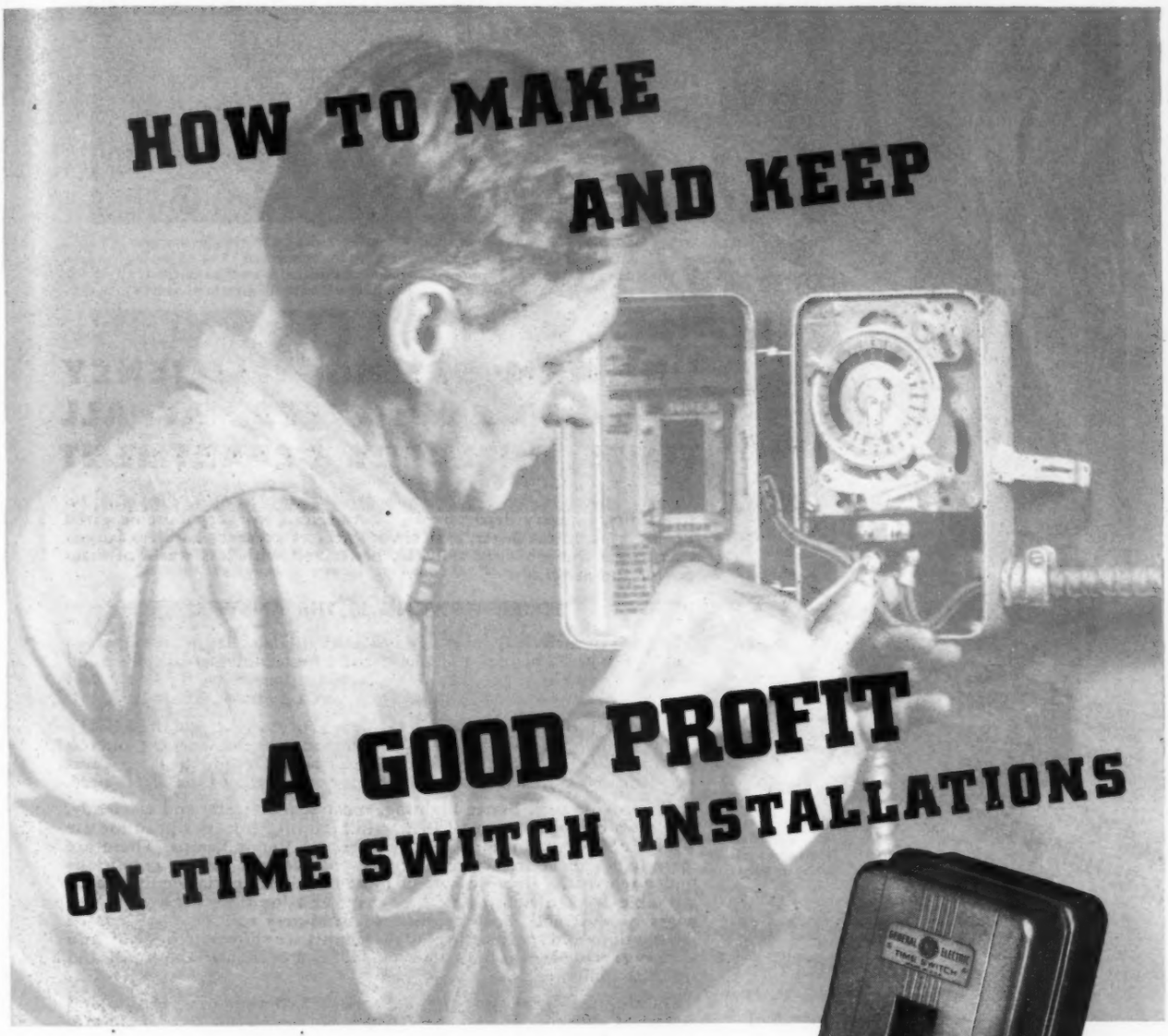
lamps and motor driven equipment necessary, each table is equipped with a continuous run of Plugmold, surface mounted, down the center of the table. Receptacles installed on 12-inch centers provide connections for electrical equipment used on both sides of the tables.

Circuits feeding the Plugmold and other electrical equipment are run in 2½-inch square duct along the ceiling with conduit drops to each table.

AIR SHOVELS

When C. M. Davis & Sons, electrical contractors and engineers of Harrisburg, Pa., have a tough excavating job to do, they use air shovels.

These handy bits of equipment are shaped like a shovel and fit into an air gun in the same manner as a drill. They make a seemingly tough job become comparatively easy.



THE General Electric Type T-44 time switch will help you *make* a good profit because it gives you a good selling margin and because it's easy to mount, wire, and connect—thus saving you time and money on each job.

Here's why it's easy to install

1. Plenty of space beneath the terminals, five standard knockouts, two mounting holes and one hanger lug, and clearly marked connections make wiring speedy and sure.
2. Small and lightweight, it can easily be held in one hand.

It will enable you to ***keep*** your profit because it is dependable and eliminates costly call-backs.

Here's why it requires no service calls

1. Its silver contacts are amply rated (35 amp).
2. It's designed by engineers who know the duty expected of time switches. Every screw, pinion, and gear—in fact every single part—is built for dependable day in and day out service.
3. The reliable Telechron motor assures long, accurate service.

The T-44 time switch is a stock item with all General Electric distributors. This means you won't need to hold up a wiring job waiting for a shipment of switches. If your regular supplier does not handle G-E time switches, get in touch with the nearest G-E office. They'll send you as many as you require that same day.

Bulletin GEA-1427 gives complete information about the T-44. Ask the nearest G-E office for copies. Or write to the General Electric Company, Schenectady, N. Y.

GENERAL ELECTRIC

UNIFORM SEEING EFFICIENCY FOR ALL EMPLOYEES, AT ALL TIMES, IN EVERY DEPARTMENT

In every plant engaged in Defense production . . . on night shifts, on day shifts, in every department . . . American workers must be given keener eyes, to see faster, easier, with greater accuracy and less fatigue . . . to get the job done quicker, better and with less waste of manpower and materials.

BETTER LIGHTING IS THE ANSWER

The basis of such Better Lighting is MORE LIGHT. Employees engaged in Defense production need from 35 to 75 footcandles of light for good seeing and sustained production effort. Even these high levels are less than workers near windows usually receive on clear summer days.

However, Better Lighting also involves providing light of the RIGHT KIND—the light must be evenly distributed over the working surface; must be soft and diffused to minimize reflected glare; and the lamps must be adequately shielded to protect the eyes of the worker from direct glare.

To provide such Better Lighting, most economically and efficiently, there is a complete range of Benjamin Lighting Units designed for use with Fluorescent, Incandescent or Mercury Vapor Lamps. There are many types of construction designed to meet the service conditions under which the lighting system must function. Special equipment is available for the lighting of high bays and locations with explosive gases or dust and those exposed to dampness and vapors. Detailed descriptions and specifications of these units are shown in the Benjamin Catalog, recognized as the standard handbook of industrial lighting and lighting equipment.

Durability of lighting equipment to assure continuous operation and sustained efficiency is another essential to Better Industrial Lighting. To meet this essential requirement, Benjamin Units are built with an extra safety factor of strength. The rigid standards and specifications to which Benjamin Units are built can be evaluated through examination and laboratory test. Moreover, Benjamin Units are backed by forty years of experience and a forty year reputation for making industrial lighting equipment that is "built-like-a-battleship." Benjamin Electric Mfg. Co., Dept. H , Des Plaines, Illinois.

BENJAMIN TRADE MARK

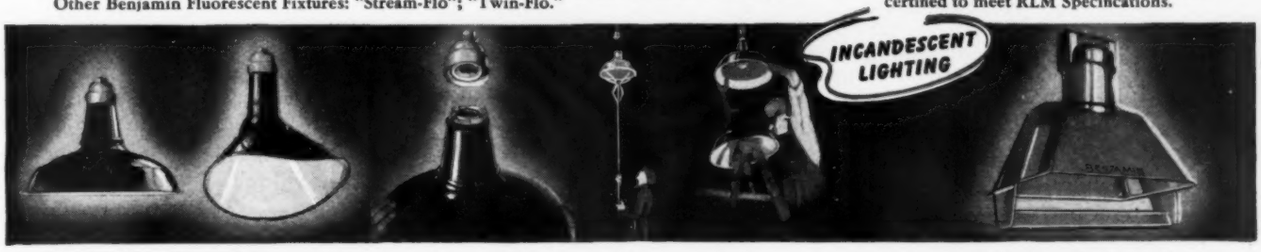
WORLD LEADER IN INDUSTRIAL LIGHTING EQUIPMENT

DISTRIBUTED EXCLUSIVELY THROUGH ELECTRICAL WHOLESALERS

TO SPEED UP PRODUCTION AND IMPROVE PRECISION WITH BETTER LIGHTING, SPECIFY BENJAMIN

New Benjamin "Lite-Line" System (left) provides, economically and at low installation cost, from 35 to 75 footcandles of lighting. Benjamin Type II-G Dust-Tight Fluorescent Unit (right) is designed for use in ordnance plants and other locations with explosive dust in atmosphere. Other Benjamin Fluorescent Fixtures: "Stream-Flo"; "Twin-Flo."

Backed by Benjamin Warranty of Performance and Construction; approved by Underwriters' Laboratories; most types certified to meet RLM Specifications.



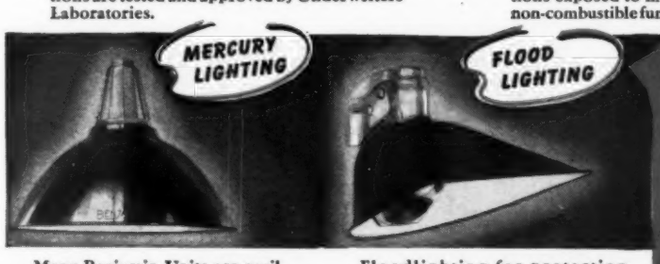
Benjamin® RLM Dome Reflectors (left), Elliptical Angle Reflectors and others are available with special Benjamin Turnlox Hood construction which permits removal of reflectors with lamp for easy cleaning or lamp renewal on the floor.

Benjamin "Stock-Bin-Lite" is designed for efficient lighting of stock bins, tool crib bins, file rooms and similar locations.

Benjamin Explosion Proof and Dust Tight Units for the safe lighting of hazardous locations are tested and approved by Underwriters' Laboratories.

Underwriters' Laboratories approved Benjamin Units are available for locations exposed to moisture, smoke and non-combustible fumes, vapor and dust.

Specially designed heavy duty water tight Benjamin Lighting Units are available for use on vessels and for other exposed locations.



Many Benjamin Units are available including the 20° Dome Type illustrated here which is designed especially for the most economical lighting of mills, erecting shops and other high bay locations.

Floodlighting for protection against sabotage and for facilitating outdoor operations at night is vital to National Defense Production. Benjamin Floodlighting Equipment is the result of years of engineering study and experience.

CALL ON BENJAMIN TO SOLVE YOUR DEFENSE PRODUCTION LIGHTING PROBLEMS!

In developing lighting plans and lighting specifications, consult the Benjamin data and specifications shown in the Benjamin Catalog 26 or Benjamin Bulletins on specific types of lighting equipment. For the solution of any special lighting problems you are invited to use, without cost or obligation, the facilities and services of the Benjamin Engineering Department.

MAIL THIS COUPON NOW FOR THESE FREE "LIGHTING BULLETINS"

BENJAMIN ELECTRIC MANUFACTURING COMPANY,
Dept. H , Des Plaines, Illinois
Please send me complete specification data and Bulletins on the type of lighting indicated below.

*Name*_____

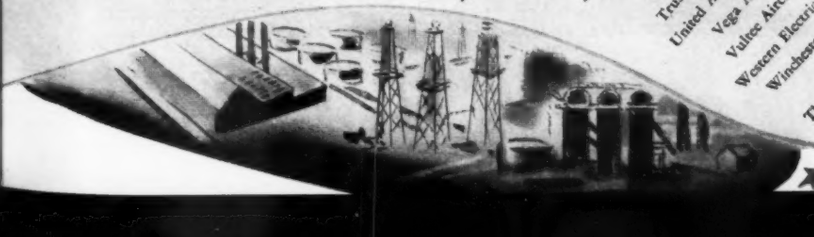
*Company*_____

*Street*_____

*City*_____ *State*_____

*Type of Lighting in which interested*_____

The Glenn L. Martin Co.
Monsanto Chemical Company
North American Aviation, Inc.
Northrop Aircraft, Inc.
Panama Canal Zone
Plum Creek Ordnance Plant
Pratt & Whitney Division
Niles-Bement-Pond Co.
Pullman-Standard Car Manufacturing Co.
Ravenna Ordnance Plant
Remington Arms Company, Inc.
Republic Aviation Corp.
Republic Steel Corporation
Revere Copper & Brass, Incorporated
Richmond Shipbuilding Corp.
Ryan Aeronautical Co.
St. Louis Ordnance Plant
Simonds Saw and Steel Co.
Solar Aircraft Co.
Swift & Company
Truscon Steel Company
United Aircraft Corporation
Vega Airplane Co.
Vultee Aircraft, Inc.
Western Electric Company, Inc.
Winchester Repeating Arms Company
The Youngstown Sheet and Tube Company
and many United States Navy Yards and Naval Air Stations
Army Cantonments, Air Bases and Stations



Better Lighting

LUMINOUS TRANSOM

The transom area in most small merchandising establishments is of practically no value as a means of letting light into the interior. Consequently it is an excellent place to start any "face lifting" program to give an establishment a modern appearance.

This illustration of The Gazelle Restaurant on Cleveland's famous Euclid Avenue, shows what can be done to transform an old front into a new model that has both daytime and nighttime appeal.

***FLUORESCENT TRANSOM** highlights the front of this establishment for famished stomachs, and provides that all-important "eye-catching" brand of luminous advertising.*

The front is of white Vitrolux glass, behind which are continuous rows of 40-watt mazda F lamps. The new exterior is really an expression of the restaurant's interior, for it too, has been relighted to present an appearance that wins customer's praise.

BLACK LIGHT DECORATES THEATER

Invisible ultraviolet radiations have been put to work to produce interesting and effective decorative lighting effects in the new 1,000 seat, Tower Theater at Roseville, Calif., near Sacramento.

***CONCEALED BLACK LIGHT** from four ultraviolet units in this central theater fixture activate fluorescent designs when the house lights are out. Here a mercury spotlight lamp is being placed behind a purple glass filter, in its housing on the fixture rim.*

Eight Westinghouse ultraviolet lamps, six of the BH-4 "black light" type and two CH-4 mercury spotlight lamps behind purple glass filters, are used to activate fluorescent pigments in the wall, ceiling and proscenium designs. When the house lights are turned off, scrolls and paintings glow with a soft pink and green visible light.

Four ultraviolet lamps are located on the rim of an 800-pound central indirect lighting fixture. Two are of the BH-4 type in polished aluminum reflectors and two of the CH-4 spot type behind purple glass filters. Fluorescent designs on the ceiling are activated by four BH-4 lamps in aluminum reflectors concealed in pockets over two exit doors on each side of the theater.

The total wattage of the central fixture, exclusive of the ultraviolet sources, is 10,000. The mounting height is 35 feet. The incandescent lamps in this unit are red, white and blue, controllable from separate circuits.

LIGHTING FOR CLOTH CUTTING

Good lighting is important in cutting rooms where cloth is cut to pattern. For one slip or wrong turn of the cutting machine may ruin hundreds of yards of cloth. And the elimination of eye strain increases employee efficiency and decreases resultant errors and waste.

Direct fluorescent lighting is used over the cutting tables of the Boris Smolner Company, Chicago. Four-foot CurtiStrip units are mounted on a continuous 70-ft. metal wiring trough over the center of each table. Each unit contains one 40-watt white fluorescent lamp mounted 52-inches from the top

***PROTECTIVE FLOOD LIGHTING** of the exterior of the new plant of the Federated Metals Division, American Smelting & Refining Co., San Francisco, Calif., is accomplished by group mounting of Westinghouse type CAK-16 floodlights with 1000-watt lamps. The units are mounted on three poles, fifty feet above the ground level. One pole has five units, the other two have four lights each. The floodlights may be operated singly or in groups and may be turned on and off by remote control from master switches located at several of the watchman's stations in the plant.*

Boosting PROFITS

FLUORESCENT CURTISTRIP

TAILOR-MADE TO A THOUSAND USES

For all around usefulness in solving lighting problems, Fluorescent CurtiStrip is hard to beat. Above you see it used for general office lighting. Notice what an efficient and dignified job it does. It is equally good over work benches in a factory or over counters in a store. Use it, with asymmetrical reflectors, for lighting vertical surfaces such as panel boards, switch boards or photo-murals.—**Can be made up in any length and for various size lamps.**

Let CurtiStrip solve your lighting problems and boost your profits.

CURTISTRIP NOW AVAILABLE WITH FLURACITE REFLECTORS

CurtiStrip reflectors are now available in steel with Fluracite reflecting surface. This is the same snow-white finish which is used on SkyLux and other Curtis products. Listed below are a few of its superior features:

1. High reflection factor (81% or more).
2. No pores to collect dirt.
3. Tough—to resist abrasion and chipping.
4. Easily cleaned (use mild soap and water).
5. Reflects fluorescent light in true colors.
6. Stays white in service.

CURTIS LIGHTING, INC.

6135 W. 65TH STREET • CHICAGO

Better Lighting

[FROM PAGE 42]

of the table. The spacing is three feet between units. The wiring trough is suspended from the ceiling by perforated band iron and one electrical outlet feeds each line of units.

CUTTING OPERATIONS in this clothing plant are facilitated by high intensity cool fluorescent lighting over the tables. Open reflector units are used.

The resultant average lighting intensity on the table top is 45 foot-candles under the center of the lamps and 35 foot-candles between units.

SYMMETRICAL TROFFER INSTALLATION

The electrical contracting firm of Symmes-Williams Electric, Inc. of

INSURED LIGHT is provided by fluorescent lamps in the troffered ceiling of this insurance company office. The white lamps used give evenly distributed cool illumination.

Here's your line-up for more money in Fluorescent!

This tells about the most exciting *profit* opportunity in Fluorescent today . . . the opportunity in Hygrade Fluorescent Lamps!

There's always a BEST!

In developing these lamps, Hygrade developed the finest methods, standards and materials. Finest workmanship . . . careful quality controls . . . painstaking checks and inspections on each lamp.

These things have made Hygrade first — *kept* Hygrade first in Fluorescent lamps.

Easier sales — less grief

And Hygrade *tells* America these facts — in aggressive national advertising that means sales and profits for you.

But—back of that—Hygrade superior lamp quality and performance means *solid* business for you . . . *less headaches . . . more profit!*

When you sell and install Hygrade Fluorescent lamps — or complete fixtures (Miralumes)— you give people most for their money: *minimum replacements . . . maximum efficiency . . . superior coating* (which turns ultra-violet into visible light) *. . . standardized colors . . . tops in performance!*

Nearly 100 patents protect Hygrade products!

Extraordinary lighting efficiencies are obtained in Hygrade Fluorescent Lamps by tuning the ultra-violet energy to the 2537 Angstrom Units wave length effective in causing the porous film (Hygrade Patent No. 2,096,693) to generate light as shown in Hygrade-controlled Patent No. 2,126,787. Hygrade products are exclusively protected by a large number of other patents, including No. 2,201,-817 and No. 1,982,821.

FREE BOOKLET!

Write today for your copy of our helpful booklet — "How To Judge the Performance of Fluorescent Lamps." Dep't. EC 9, Hygrade Sylvania Corp., Salem, Mass.

Hygrade Fluorescent Lamps

Hygrade Sylvania Corp., Est. 1901. Also makers of Hygrade Miralumes and Incandescent Lamps and Sylvania Radio Tubes

Better Lighting

[FROM PAGE 44]

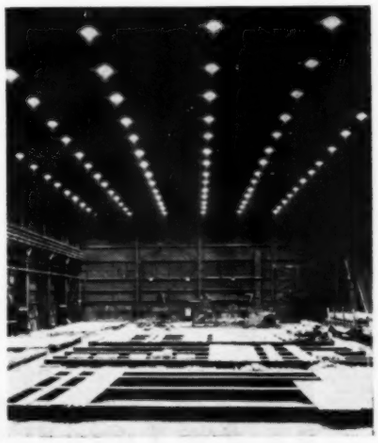
Crawfordsville, Indiana recently completed a recessed fluorescent lighting installation in the offices of the Ben Hur Insurance Company in the Ben Hur Building, Crawfordsville. This view of the general office shows the symmetrical appearance of the rows of units recessed in the acoustical tile ceiling. The installation employs four-foot troffers accommodating 40-watt white mazda F lamps. The "in service" overall lighting intensity on the working plane is 45 foot-candles.

LIGHTING FOR STEEL INSPECTION

To facilitate night-time inspection of steel billets, 96 Westinghouse "Millites" were installed in the chipping room of a large mid-western steel mill. The former 10 foot-candle intensity in that area has been raised to 60 foot-candles and a production bottleneck has been eliminated.

Good seeing is essential to proper billet inspection, for they are examined visually by trained inspectors. The outer crusted surface of the steel is chipped off, exposing the raw inner metal to the eyes of these men whose job it is to detect flaws in the metal structure.

Dirt and grime continuously collected on the reflectors of the original open type units, reducing the light output to such a degree that billet inspection could not be done at night. Even during daylight hours, frequent and



NEW LIGHTING BREAKS BOTTLENECK of production and maintenance in the billet chipping room of this steel mill. Night inspection of the steel is now possible.

HERE'S THE *Proven & Guaranteed* FLUORESCENT LIGHTING SYSTEM

That's 30% to 50% cheaper to install!

That provides 50 Foot Candles or better!

That's easier, cheaper to maintain!

IVANHOE
"50 FOOT CANDLER"
RLM *Continuous Wireway*
FLUORESCENT LIGHTING SYSTEM

● **Two years ago IVANHOE "50 FOOT CANDLER" was introduced as the first RLM Continuous Wireway Fluorescent Lighting System providing new higher levels of overhead illumination. Now its merits have been *proven* in such outstanding organizations as Fairchild Aviation Corp., Uxbridge Worsted Co., Combustion Engineering Co., General Electric Co., Curtiss-Wright Corp., and many others. Hundreds of miles of "50 FOOT CANDLERS" are today giving satisfaction in key Defense plants, industry and business.**

"50 FOOT CANDLER'S" continuous wiring channel (containing all necessary auxiliaries and up to 80 per cent of conduit) means installation savings of 30 to 50 per cent. Speedy installation, too—with no slow-up of production while lighting is going in. Easy-to-remove, porcelain-enameled reflectors lick maintenance headaches.

IVANHOE "50 FOOT CANDLER" can give your customers and prospects these *proven* lighting benefits—save you precious man-hours in installation. *Write for helpful Bulletin 1C.*

FAIRCHILD AVIATION CORP. employees get 50-55 foot candles of light for fine inspection and assembly jobs with "50 FOOT CANDLER" in this new plant addition.

COMBUSTION ENGINEERING CO. use their new "50 FOOT CANDLER" lighting system to give draftsmen 60-65 foot candles of unmatched working light.

UXBRIDGE WORSTED CO. use many rows of "50 FOOT CANDLERS" in their weave rooms. Here workers have the production aid of 50 foot candles of well-diffused illumination.

• • •

MILLER OFFERS A COMPLETE LINE of incandescent and fluorescent lighting equipment, backed by almost 100 years of commercial and industrial lighting specialization. There is an answer to your problems in this *unbiased* lighting service.

IVANHOE FLUORESCENT RLM

THE MILLER COMPANY
MERIDEN, CONN.
Pioneers in Good Lighting Since 1844

Better Lighting

[FROM PAGE 46]

consequently expensive cleaning of the reflectors was necessary to carry on the inspection work.

The new "Millites" replacing the old units are totally enclosed with clear glass, dust-tight lenses. They are mounted 40 feet above the floor of the room on 12-ft. by 12-ft. spacings. Each unit uses a 1000-watt incandescent lamp.

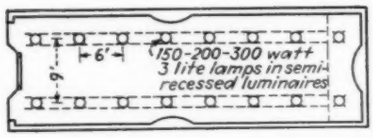
Lighting intensities on the working plane now average 55 to 60 foot-candles, as compared to the original 5 to 10 foot-candles. And the change-over has eliminated a production and maintenance bottleneck.

Lighting a JEWELRY STORE *Incandescent*

PROBLEM—To provide a high level of illumination with intense direct distribution for satisfactory display and merchandising of jewelry.

CONSTRUCTION DATA—The sales area measures 15- by 48-ft. with 13-ft. ceiling height. Upper walls and ceiling are light, lower wall and case are finished in dark wood colors. Behind the counters, display cases are illuminated with supplementary lighting.

SOLUTION OF PROBLEM—Sixteen semi-recessed, louver controlled, direct lighting units are installed in the ceiling over the counters. Each luminaire is equipped with a 150-200-350 watt three-light lamp. The units

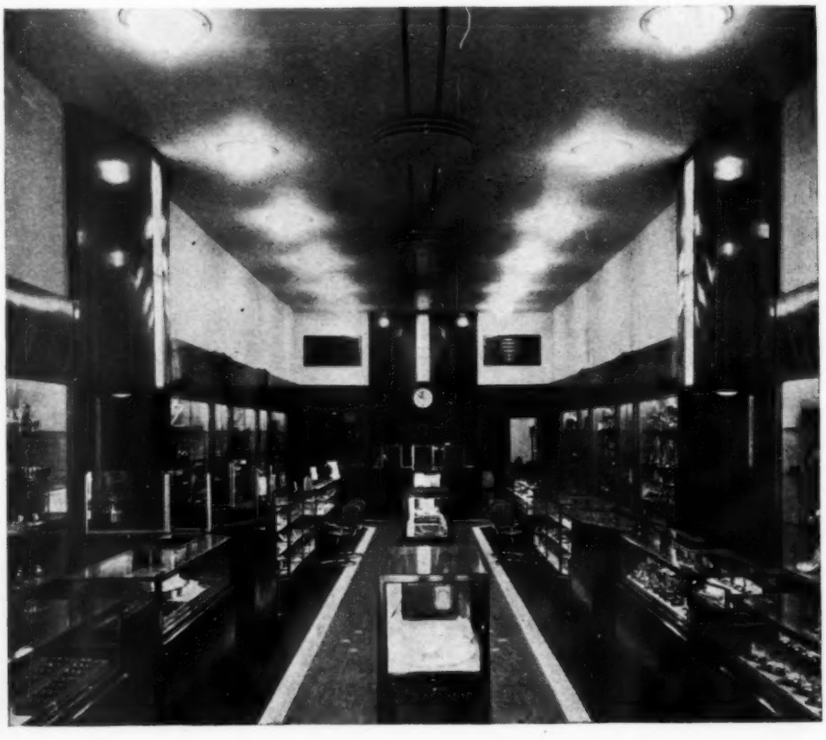


LAYOUT PLAN *of the lighting system showing spacing of luminaries.*

are spaced on 6-foot centers in each row and the rows spaced 9-feet apart.

RESULTS—An average of 50 foot-candles at the counters and 30 foot-candles down the center of the store with full intensity, and proportionately lower intensities with the 150 and 200 watt filaments alone.

CEILING MOUNTED *incandescent lighting units deliver 50 foot-candles to the counter level in this jewelry store.*



Look for THIS LABEL

TO BE SURE OF GETTING DEPENDABLE FLUORESCENT LIGHTING FIXTURES

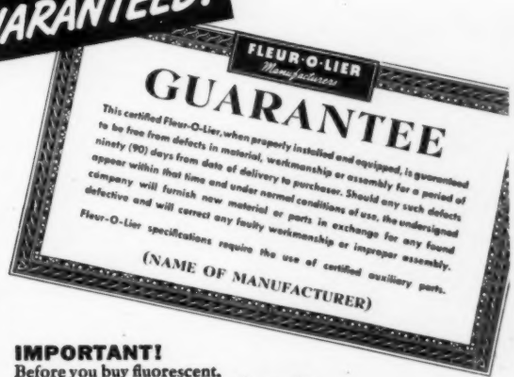
(C)

These 3 SAFEGUARDS ASSURE YOU OF SAFE, SATISFACTORY PERFORMANCE

TESTED! Famous Electrical Testing Laboratories put FLEUR-O-LIER fixtures through exhaustive tests, which include such vital points as FLICKER CORRECTION, DURABILITY AND SAFETY, EASE OF MAINTENANCE, DEPENDABLE BALLASTS AND STARTERS, EFFICIENT LIGHTING PERFORMANCE, AND HIGH POWER FACTOR (OVER 85%).

CERTIFIED! Based on these tests, Electrical Testing Laboratories gives the FLEUR-O-LIER manufacturer the right to affix the label of certification to all fixtures identical to the sample submitted. This label is your assurance that the fixture wearing it meets the 50 rigid specifications set up by MAZDA lamp manufacturers for better light, better service. E.T.L. maintains a constant check-up of random sample fixtures—thus assuring *uniform quality.* You can buy Certified FLEUR-O-LIERS with confidence!

GUARANTEED!



IMPORTANT!
Before you buy fluorescent, check with your local electric service company. They will give you expert advice on how to install fluorescent fitted to your specific needs.

WIDE VARIETY! You can get Certified FLEUR-O-LIERS in over 100 different designs and in a wide range of prices.

FLEUR-O-LIER
Manufacturers

Participation in the FLEUR-O-LIER MANUFACTURERS' program is open to any manufacturer who complies with FLEUR-O-LIER requirements

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Fleur-O-Lier Manufacturers • 2122-9 Keith Bldg., Cleveland, Ohio

Please send me FREE new booklet "50 Standards for Satisfaction," together with list of Fleur-O-Lier manufacturers.

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SEE HOW YOU

WITH THE

Extra Convenience Features

HELP YOU GET THE TRI/CLAD MOTOR INTO SERVICE FASTER . . . KEEP IT IN SERVICE WITH LESS ATTENTION.

Easy to Handle

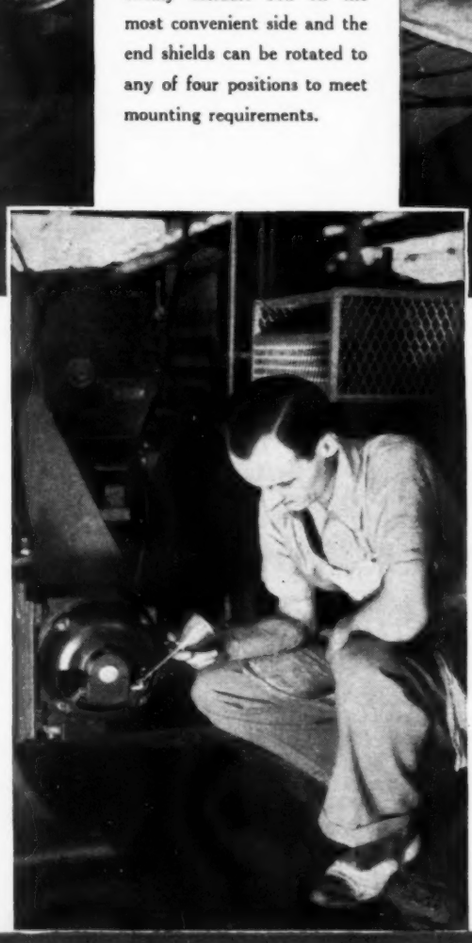
1. They can be moved into position easily because of their light weight and compactness. The shape of the bearing housings and the location of end-shield fittings make it easy to handle Tri-Clad motors with slings. In addition, they are sturdily built and do not have to be coddled.

Quickly Mounted or Altered

2. Their feet are machined accurately and drilled for standard mounting bolts. The reversible stator puts the roomy conduit box on the most convenient side and the end shields can be rotated to any of four positions to meet mounting requirements.

Simple to Align

4. Accurate alignment, with the minimum of shimming, is afforded by their rigid, cast-iron frame construction, close machining tolerances, and accurate milling of feet. Pinions, pulleys, or couplings can be properly fitted because of close machining of the shaft extension and convenient shoulders on the shaft.



Convenient to Lubricate

5. Tri-Clad motors have a large oil or grease capacity. On sleeve-bearing motors, the oil-filler gage can be located on either side of the bearing housing. A spring cover on this gage permits quick checking of the oil level. On ball-bearing motors, a pressure-relief greasing system assures rapid and thorough greasing.

BUILT FOR PROTECTION FIRST . . . TO LAST

SAVE TIME

TRI-CLAD MOTOR

REG. U. S. PAT. OFF.

Easy to Wire

3. A large, four-position conduit box gives unrestricted working space. It can be quickly removed for wiring. Flexible leads are pressed on the terminals, which are permanently identified. No soldered connections are necessary. A stainless-steel, graphic connection plate is conveniently located on the conduit-box side of the motor.

Extra Protection 3 Ways

HELPS ASSURE LONG SERVICE LIFE

Production interruptions are avoided and operating time is saved when the motor you buy can stand up under the many adverse operating conditions commonly found in industry. Tri-Clad motors meet these conditions with—

1 Extra Protection against physical damage

2 Extra Protection against electrical breakdown

3 Extra Protection against operating wear and tear

Write for Bulletin GEA-3580, which gives full details of these extra protection features and other Tri-Clad motor advantages.

Easy to Clean

6. The smooth, rounded contours of the Tri-Clad motor—with the upper portion completely enclosed—have few recesses or projections to catch and hold settling dust. Such dust as does settle on the motor can be readily wiped away with a cloth or piece of waste.

THE new General Electric Tri-Clad motor is a cinch to install. Its convenience features pay off in precious minutes saved—both for those who build motors into machines and for those who use them in the plant.

Next time you order motors, take *time saving* into account, along with protection and performance; make sure you get Tri-Clad motors—now available in a wide range of types and integral horsepower sizes to 20 hp. General Electric Company, Schenectady, N. Y.

GENERAL ELECTRIC

750-82-6056

Let's Talk About Union Labor

[FROM PAGE 20]

abuses in union management. For the abuses of union mismanagement upon its membership are also, in themselves, basic factors in the relationship between the union and the employers.

What abuses, for example? Well, one experienced contractor, I know, wise in his long contact with labor, lists these eight reforms within the unions, which he believes are necessary to harmony in our industry. He believes that—

1. Any wireman whom an employer will hire, should be received into the union.
2. No excessive initiation fees or unreasonable examinations should be used to keep men out of the union.
3. Business agents and officers of the union should come up for re-election at least once every 18 months and the election should be conducted by voting machines, in the presence of a representaitve of the U. S. or State Department of Labor.
4. Any business agent who takes money from a workman to place him on a long term job should be prosecuted for misdemeanor, as any public official can be.
5. If any business agent accepts money from an employer to grant him special favors, they should both be prosecuted for misdemeanor.
6. The union should not be permitted to charge its members exhorbitant dues.
7. A list of officers and a financial report, prepared by a C.P.A., should be filed annually by every union with the U. S. and State Departments of Labor.
8. The books and records of every union should be annually audited by the Department of Labor and a copy of the audited statement should go to every member in good standing.
9. No business agent of a union, while so employed, should use his position to advance himself in local, state or national politics.

Now this may not be the best program for reform within the unions. The membership, when it begins to think more actively, more independently on the matter, may see it differently. But it sounds like the kind of control that a sensible wireman would like to see established in the management of his union for his own protection.

The discussion and adjustment of these or similar principles and policies will inevitably arise out of any serious program of local industry meetings. The union membership will inquire also into practices of the contracting business and these also should be thoroughly aired. Out of it all will come such action as the union membership desires to take for its own advancement, through self-government.

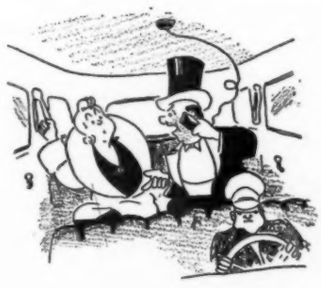
L. K. Comstock, chairman of our Council on Industrial Relations, goes a step further. In a statement published some time ago, he advocated that the strike be outlawed in America, and his reasoning is sound.

The strike, he points out, was adopted as a weapon of offense and defense when the worker had no standing before the law. If he did not like his job he could quit—management said. But how could he live? So down through the years, labor has fought its way to higher wages, shorter hours, and better working conditions and America has benefited by higher standards of living and improved industrial welfare. But now, says Comstock, labor has ample standing before the law. In fact, it has protection through the Labor Relations Board and the Wagner Act beyond that accorded to management. Therefore, labor no longer needs the strike and it should be abandoned. Questions that cannot be settled in the shop council or by arbitration should be taken to United States Industrial Courts, whose judgments would be binding. I hope that the day will soon be here. The present wave of strikes against defense industries is certainly hastening it along.

Public Interest

For in America public opinion still rules, thank God! The public interest is paramount and those who forget it are bound to find out. We have been conspiciously without strikes in our industry. But the relationship between employer and employee in our field is still a matter of public interest and concern. For it affects the cost of wiring and the progress of building construction.

It is up to us, therefore, to look this matter in the face. It's time to lay aside the fear. It's time to stop the bickering. It's time to evolve a better system. And if we can operate our control over strikes, through the Council, we can go further in other directions.



"FINE THING.... WE'VE A MILLION DOLLAR HOME AND NO OUTLET IN THE BATHROOM!"

THESE FAN MOTORS in dry kiln of Virginia lumber company operate overtime during present speed-up. Surrounded by corrosive tannic acid vapor; humidity, 100%; temperature, 210 deg. F. No downtime, because Fiberglas-insulated motors withstand overwork in these tough operating conditions.

How are you licking the problem of tough surroundings?

TODAY'S PRODUCTION pace presents motor and generator users with a double-barrelled hazard—

1. Speed-ups are multiplying demands on equipment . . . causing breakdowns.

2. Multiple shift operation is doubling and tripling normal wear and tear . . . cutting the life of even the best equipment *proportionately.*

How are you licking this problem in your plant?

One wise method is to have your present equipment rewound with Fiberglas Electrical Insulation.

Here's why it licks excessive loads from speed-ups. This modern insulation has a longer life under high temperatures than asbestos and a considerably greater margin of safety than cotton.

And here's why it helps lick the hazard of increased exposure to excessive heat, corrosive vapor, and humidity. Fiberglas insulation itself is completely inorganic and has a considerably greater life under these tough operating surroundings than asbestos.

In addition, much equipment, rewound with Fiberglas in place of cotton, may be operated safely at increased horsepower output. What's more, rewinding old equipment with Fiberglas often solves the problem of a possible long wait for new equipment—which may be very difficult to get in these times.

If you can get new motors or generators promptly, your manufacturer can supply them with Fiberglas insulation, *on your order.*

Remember! Scores of industries—mines, steel mills, chemical plants, plants with "process dust" operations—have already reinsulated with Fiberglas and saved thousands of dollars in downtime. Consult your electrical repair shop. Specify Fiberglas. Write for further information to *Owens-Corning Fiberglas Corporation, Toledo, Ohio. In Canada, Fiberglas Canada, Ltd., Oshawa, Ontario.*

*T. M. Reg. U.S. Pat. Off.

OWENS-CORNING

FIBERGLAS

MODERN PORCELAIN PROTECTED WIRING SYSTEM OUTLASTS THE BUILDING

Ageless Electrical Porcelain Stands up under the Worst Conditions Encountered in Wiring Installations, Unaffected by Dampness, Salt Sprays or Corrosive Atmosphere.

●

The value of porcelain as an unequaled insulating material was recognized as early as 1860 and its place in the electrical industry grew with the years.

Designers of electrical distribution systems make full use of porcelain insulation. The growth of the electrical porcelain industry and the present-day dependence placed upon this material in modern distribution of electrical energy speaks volumes for the all-around insulating characteristics of porcelain.

There are millions of homes in America wired with Porcelain Protected conductors, some dating back as far as 1890. The principle of wire spacing as is followed in Modern Porcelain Protected Wiring is evident in what is claimed to be the first residence in the United States to be wired for electricity in Green Bay, Wisconsin.

Modern plumbing conveniences with its varied applications requiring that water be supplied to almost every part of the home. Bathrooms, kitchens, laundries, furnaces, etc. have created additional consideration from the architect who must lay out the wiring plans in accordance with these new demands. Condensation producing moisture and dampness provide many leakage paths for electrical currents. These are dangerous to life. By using Modern Porcelain Protected Wiring, this hazard is reduced to a minimum, for

BULLETIN

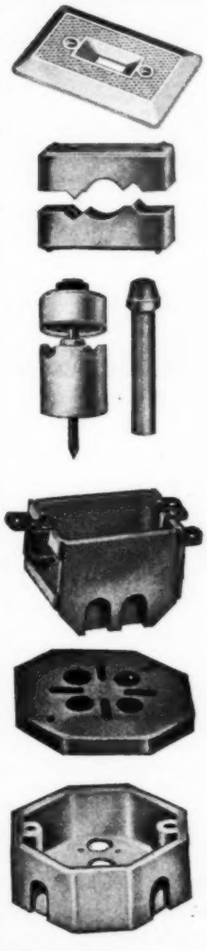
Defense Production aided through Electrical Industry's use of All-Porcelain Boxes. Action releases vital metals for defense needs.

Porcelain Outlet Boxes and wiring in open air keep electrical energy in the path where it belongs. Porcelain is non-corrosive and spaced conductors do not lie in wet containers to rot away the insulation.

Porcelain Protected Wiring is especially recommended for corrosive atmosphere. Present-day manufacturing includes chemical processes which will destroy ferrous or non-ferrous materials. Porcelain is not destroyed by chemical action; hence with the newer wire insulations, it is the true and logical barrier to destructive corrosion.

Hundreds of thousands of porcelain boxes have been installed in farm buildings where moisture and corrosive ammonium vapors exist and have demonstrated their values of durability and safety. Modern Porcelain Protected Wiring Systems have solved the troublesome condition of corrosion, smoke and moisture in railway yards and terminals.

Electrical energy distribution suffers continual replacements from salt air atmosphere in coastal cities. Many localities have corrected this by using Modern Porcelain Protected Wiring Systems. Industries and real estate owners in other sections are rapidly recognizing the permanent values of Porcelain Insulation.



Modern Porcelain Protected Wiring Systems have an enviable record of performance. The National Electrical Code has indicated adequate rules for protecting conductors in Modern Porcelain Protected Wiring Systems. Inspectors, utility executives and fire insurance underwriters say that buildings wired with Modern Protected Porcelain Wiring Systems by skilled contractors are the best assurance of adequate permanent trouble-free and safe electrical installations.

Electrical porcelain materials for Modern Porcelain Protected Wiring systems are manufactured by

Knox Porcelain Corporation, Knoxville, Tennessee
Illinois Electric Porcelain Company, Macomb, Ill.
Porcelain Products, Incorporated, Findlay, Ohio

and may be obtained through your electrical wholesaler.

ADVERTISEMENT

Industrial Electrification

ENGINEERING · INSTALLATION · MAINTENANCE

WASTE REDUCTION

WASTE is a word that has been associated with production since the birth of industry. Much has been done to eliminate it. But much still remains to be done, especially today when National Defense makes speedy production and material conservation paramount.

There are many methods of saving time, material and equipment. The addition of a conveyor, phototube control or the use of high cycle equipment may save considerable time. The use of an additional motor or the replacement of an existing one with one of the correct type may do much to lengthen the life of equipment. And the introduction of high intensity lighting, phototube controls and flaw detectors can eliminate considerable material waste.

These are just a few of the numerous electrical ways to reduce waste. Many more are discussed in the accompanying article. For the convenience of the plant electrical man, the Check Chart lists 16 tested electrical ways to eliminate waste. With his thorough knowledge of the plant electrical system and the production operations, the electrical maintenance man should have little difficulty in discovering where waste exists and making suggestions to the management.

Previous articles covered—

1. Simplifying Electrical Maintenance
2. Preventive Maintenance of Distribution Systems
3. Preventive Maintenance of Electrical Equipment
4. Reducing Power Costs
5. Maintaining Good Power Factor—Part I
6. Maintaining Good Power Factor—Part II
7. Meeting Severe Service Conditions
8. Eliminating Causes of Severe Service Conditions
9. Providing Adequate Capacity for Increased Demand
10. Electrifying Operations to Reduce Unit Costs
11. Safety Protection for Electrical Operations
12. Increasing Flexibility of Electrical Service
13. Electrical Aids to Automatic Control
14. Electrical Ways to Reduce Waste (this issue)

Future articles will discuss—

15. How to Save Power
16. Protection Against Sabotage
17. Electrifying for Continuous Operation
18. Improving Working Conditions
19. Electrical Aids to Quality Control
20. Electrified Plant Housekeeping

ELECTRICAL WAYS TO REDUCE WASTE

"MILL-BLINDNESS is our worst handicap," said the chief engineer of a large company having plants in several eastern states and Canada. He went on to say that his men were so accustomed to things as they were that they no longer saw what they really were. As a consequence, visitors to the various plants were sometimes amazed at wasteful practices because they were not "mill-blind"—at least when away from home.

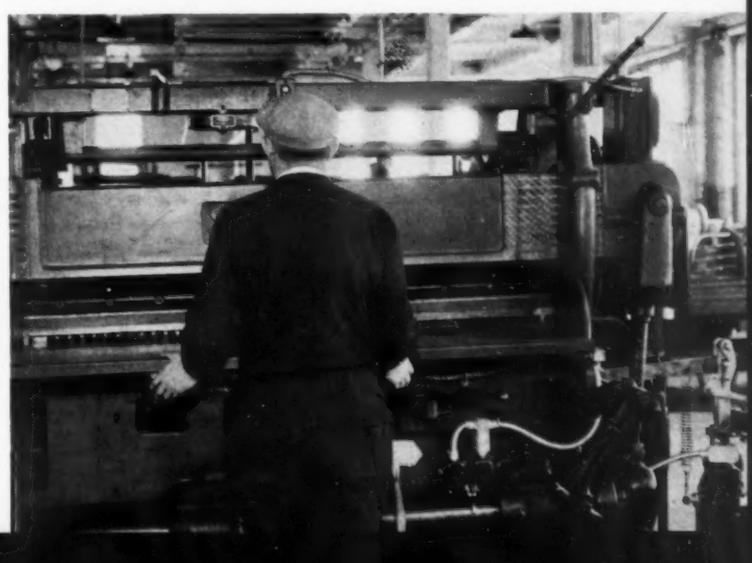
So it often pays to take a turn out through the gate and come back in as a stranger, and to look with eager curiosity at everything that is going on. The resulting surprises are likely to be worth a lot to the company.

Outside of labor, the four main ingredients of industrial production are time, equipment, and materials, and power. One may be sure that they are all being wasted to some extent. Also, these wastes cannot be entirely eliminated. The thing to do is first to find and attack the major wastes, plug the leaks, and second go after the lesser but perhaps more numerous sources of loss. We will talk about waste in time, equipment and materials here and will devote a separate article to "How to Save Power."

1. Time Wasters

The waste of time may be obvious to one who knows a better way. But too often a long established system of operations goes on because no one in authority knows what others are doing with new ideas.

A very common type of time waster is found in batch operations involving starting up, running a batch, and moving the material to the scene of the next operation. Continuous processes are much more economical, but often call for close speed relationship between



HELPER MOTOR, a thrustor, operates the clutch on this shear only when the operator pushes two buttons at once. Time and fatigue are saved and the operators hands are safely employed. (Photo General Electric)

motors on sequence steps, when operating on the same piece of material. Such systems of machines are called trains, lines, ranges, or sectional drives. Automatic control is well worked out, together with suitable motor types, hence conversion from batch to range drive is not difficult.

Conveyors are almost endless in variety and application. All are time savers, because they save a multitude of small trucking or carrying chores. Great ingenuity is shown in the design of conveyor systems, and time spent in such planning will be well rewarded.

One small motor, for example, replaced several on individual conveyors in a processing plant. At first, containers were conveyed independently to the various packing points. Overs, and shorts, caused delays and conveyors sometimes jammed because some one failed to keep up at the discharge end. A new all around gravity system was installed, with one vertical conveyor to the top floor. Now container units go all around and are picked off as wanted; there are no shorts, and overs simply repeat the round trip. One motor, less power, less maintenance, better production conditions resulted.

Again, one can always consider electric heat for cold weather material-moving delays. Tank cars of viscous liquids often nonflowing in cold weather have required heating in an enclosure or by inserted steam pipes, in either case a slow process. This work is now carried out rapidly by concentrating heat safely at the discharge point by the use of resistance cable such as soil heating cable or calrod. Where a suction pipe and pump are used, a few turns of soil heating lead covered cable wound in the pipe near the suction end keeps the material free-flowing in that neighborhood. Thus a little heat applied in the right place serves to empty the car quickly without waiting to heat up the whole contents of the car.

Again, vacuum tube control systems, with or without the "Electric Eye" have speeded up many operations. Wire-drawing affords an example. Erratic tension required comparatively slow operation to avoid too many breaks. Tube tension control took out the uncertainty and the wire type of drawing could be speeded greatly.

Printed or decorated rolls of paper, or other material, have to be cut to close limits between patterns, the limit of speed being the human eye. Here physical limits and fatigue provided a bottle-neck in production, while the large expansion machines were capable of much higher speed.

The electric eye replaced the observer, and the operations were speeded up as much as four to one. The phototube has to observe the signal mark or color change only about one five-thousandths of a second to decide if the web is fast or slow for the cut, and to take the necessary action to correct the trouble. Postage stamps are perforated in the narrow zone between patterns by this method, and at very high speed.

Phototubes and other electrical means are available for inspecting material in various stages and, further, they take charge and make corrections if tolerances are likely to be exceeded. They can throw out defective parts and divide them into classes, as well. The acceptable units are counted and stacked in piles as required. Hand methods of inspection are too slow on steel going over 2000 feet per minute, so an electric device measures it "on the fly," and controls motors to keep it within balance.

When speaking of inspection we also logically think of testing operations. Here is an interesting case. High frequency power is used in a novel manner for testing mechanical fuses for shells which revolve at 16,000 rpm. as they leave the gun muzzle. To produce this speed on test stands, motors are connected to a 270 cycle circuit and are able to attain 16,000 rpm. in one second. After test readings are taken the motors are brought to rest in one second by direct current dynamic braking. Since starting and stopping occupies a large part of the operation, testing is greatly expedited by the use of high frequency.

2. Equipment Wastes

Needless wear and tear on machinery not only shortens life, but induces break-downs with stoppage of production. And it is an exasperating fact, of course, that machinery breaks down when it is being worked the hardest, and is needed the most.

It happens that the most efficient motor from the input-output standpoint, may raise havoc with the machine, and prove inefficient from the production standpoint. Direct-current motors, especially with the adjustable voltage (Ward Leonard) type of control, provides a cushioned drive that is kind to all connected machinery, yet holds production to maximum. Such a drive involves an a.c.-d.c. motor-generator set, with a generator for each d.c. motor or group of motors that operate as one.

The overall efficiency is low, compared with a single a.c. motor, and the cost is high, but its marvelous speed control, relentless driving power and smooth buildup of torque, have made adjustable voltage d.c. drive the leader on tough jobs. The large power shovel, a huge machine that is forced to the limit on faster than once-a-minute cycles, would not hold together a week under the slam-bang of ordinary drives. Steel mill auxiliaries, paper machines, saw mill carriages, mine hoists, metal planers, and hundreds of other hard working machines, use this d.c. drive which has brought the d.c. motor back, after being nearly exterminated by a.c. drives.

There is a difference, even in a.c. drives as to wear and tear on machinery. A squirrelcage type of motor, on a machine having chain gearing and much flywheel effect, would break chains in its impatience to get up to speed. A wound-rotor motor can take

TIME SAVING—This bank of reflector type infra-red lamps cuts baking and drying time of small armatures to one hour. Work no longer piles up.

MAINTENANCE GUIDE SHEET

TESTED ELECTRICAL WAYS TO CUT WASTE

These sixteen "formulas" and references should help to size up the problem in your own plant. Also they should help you to arouse further interest in the subject by the management.

1. . . One kilowatt wasted equals $48 a year. . . . This assumes a cost of 2 cents per kilowatt hour and a use during 8 hours a day for 300 days a year.

2. . . Ten percent slower speed loses 250 miles a year. . . . Assuming a machine producing a strip of material at a rate of 100 feet a minute, 8 hours a day for 300 days a year.

3. . . Ten minutes drag getting up to speed equals a good vacation. . . . Assuming an operation, attended by three men, that is only half efficient during ten minutes starting-up time once a day. Even this wastes 75 man hours a year, enough to pay a workman for a good vacation.

4. . . Re-closing circuit breakers for momentary overloads stops thumb-twiddling. . . . Assuming average fuse replacement after a momentary overload requires fifteen minutes for replacement order to go through and job to be done, the interruption is of sufficient duration to make whole department restive and out of gear.

5. . . Collecting valuable dust pays part of dividends. . . . In one company where the air contained free "glaze" dust with an average value of a dollar a pound, ten electrostatic dust precipitators recovered values up to $1600 a week.

6. . . Intercommunicating system saves a marathon. . . . Assuming a production manager who leaves his desk fifteen times a day to deliver instructions personally, (average round trip 150 feet) he covers a marathon (26 miles) on foot about every two months.

7. . . Portable belt sander saves old cases. . . . When brand name was changed a brewery faced the loss of all the old cases, since the old brand marks had been burned into the wood. However, a portable belt sander was put to work. It removed old brand marks at a rate of four cases a minute and left a surface suitable for rebranding.

8. . . Recording ohmmeter saves the fish. . . . Acid discharged in too great concentration into a southern river by a chemical plant killed the fish. A recording ohmmeter now controls the situation by giving a continuous record of conductivity of the water. Acid content can be measured from this record. Chemical analysis is no longer required.

9. . . Electric washing machine reclaims rags. . . . Laundering discarded rags and cheese cloth reclaimed material worth $6275 in a single plant, at such a small cost that the profit was $5400.

10. . . Push button control saves skilled labor. . . . In many companies push button controls on conveyors and proper interlocking to prevent damage in case of error has permitted the equipment to be operated by "lesser-skills."

11. . . Maintenance of rated voltage restores 30 per cent lost light. . . . Assuming voltage drop of 10 per cent below normal, lumen output of lamps drops 30 per cent.

12. . . Freeing packing system of jams from faulty cases by electric eye, saves a "40 hour week." . . . Assuming 50 employees on a continuous filling and packing line, with ten minute interruptions caused by faulty cases, jamming five times a month, equals 40 hours saved.

13. . . Immersion heating units save auxiliary boiler operation. . . . In a middle western plant an auxiliary boiler had to be operated solely to prevent the freezing of a water tank used for fire protection. 40 kw. in immersion heating units replaced the boiler, saving $140 operating cost in one month.

14. . . Waiting for it to cool equals a summer's work. . . . Assuming ten seconds saved in a sixty-second cycle total operation; by forced cooling, two months working time is saved each year for each operator.

15. . . Starting machines one at a time recovers power factor. . . . Without use of other corrective apparatus, friction clutches on each drive, restored 8 per cent on plant power factor in an eastern plant.

16. . . Electric baking oven in repair shop saves 50 per cent of motor rewinds. . . . A railroad repair shop saved $17,500 a year by installing an electric baking oven in place of a fuel fired unit. The new oven doubled the coil life of rewound motors and generators.

***VALUABLE WASTE MATERIAL** is separated under fluorescent lighting at Westinghouse Lamp Division, Bloomfield, N. J. With ordinary light the tantalum scrap (A) looks too much like the molybdenum piece (B). Fluorescent lights show the difference at a glance.*

up slack, then gradually build up torque and speed, without causing trouble.

Some machines require one part to drive another part. For instance, the sheet forming felt on a cylinder paper machine has to drag the cylinders. This is using a special-function, expensive wool blanket as a power transmission belt. The modern way is to put a small motor on each cylinder, letting the felt keep them in synchronism. This relieves the felt of severe stretch, it lasts longer and forms a better sheet. Helper motors are being used on many types of machines for similar purposes.

With some large machines the problem is to know when the safety point of operation is being approached. Strain gauges using special electric "bridge" circuits have been applied to the housings of huge high-pressure rolling equipment. The minute stretch of a short section of the housing is magnified to as much as four inches on an instrument scale. The operator knows when he is approaching the limit of safety and can thus avoid excessive bearing wear or a long-time consuming breakdown of the machine.

In these days when machines are pushed to the limit for long hours under pressing need for high production, it would be well to survey all motor drives for suitability from the machinery's viewpoint. Especially, all outages should be studied to see if some more suitable motor, control, or helper motors, might eliminate that wastage.

What about assuring performance of occasionally used equipment? Motors that stand idle for months in damp places are subject to deteriorations and may fail when load is applied. It is now common practice to fit such motors with space heaters which keep the windings a few degrees warmer than the atmosphere in order to prevent condensation or "sweating." A 1250 hp. pump motor which has to dewater a water supply syphon every five years in Baltimore is so protected.

Operating speed is a subject always worth a complete check up. Often some simple corrective device will enable a machine to run safely at higher speed, thus reclaiming machine efficiency which otherwise is wasted. Improved general lighting often permits this faster operation and a lighting survey almost always is worth its weight in increased output. Sometimes, however, the use of lighting goes beyond good general illumination. Supplementary lighting is decidedly on the uptrend.

The speed at which a cloth printing machine can be operated depends upon the operator's ability to scan the work for color register and defects. Speeds commonly attained are between 50 and 70 yards per minute. A new device employing long fluorescent tubes brightly illuminates the printed cloth for less than one-thousandth of a second for each pattern "repeat." By this means, the operator sees the pattern apparently standing still,—the old stroboscopic effect brought up to date by electronic tube control and fluorescent lighting. Speeds double and triple normal are attainable, and more when printing machines are developed for higher speeds.

3. Material Waste

When the product is not up to specifications, whether cement, cotton sheeting, ball-bearings, or radio tubes, there is waste. Much material has to be degraded, worked over or scrapped. It is not the material loss that is so serious, but the loss of production time that is never made up.

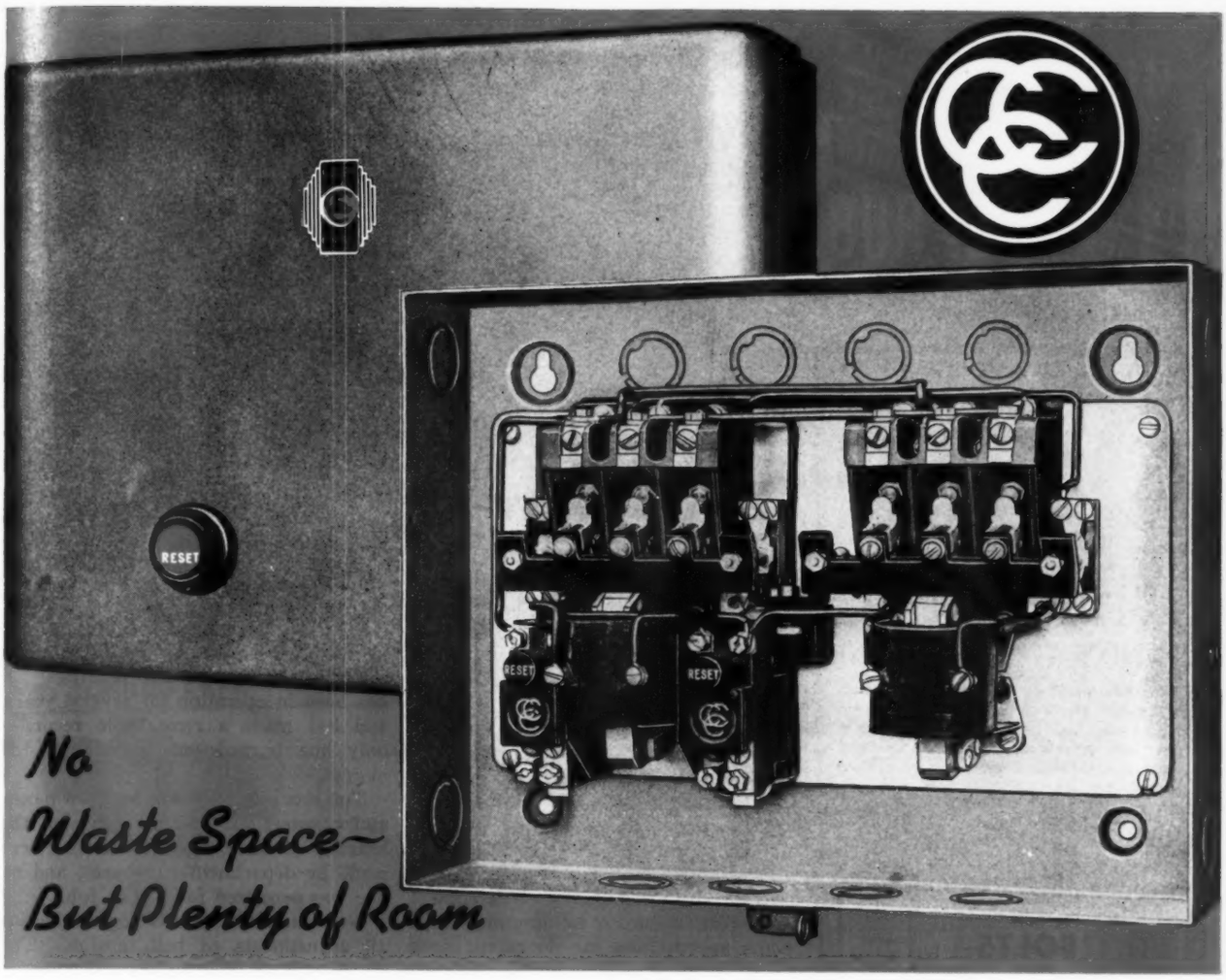
The phototube is one of the electrical man's best bets to check material waste. Sunday colored supplements to newspapers were thrown out to the tune of $17,000 worth per year by one publisher, because the human eye and hand were not fast enough to keep the various units of the printing press in color register. Now, a phototube system, devised by General Electric, keeps four colors on one side of the sheet, and three on the other, in perfect register so much of the time, that the waste is negligible. The cost—half a year's former waste.

When woven goods are out of square, that is, with filling threads skewed, the goods will not tear square, hang well, or maintain printed designs in the intended shape. Much waste and degrading of goods has prevailed in the textile industry on account of this bugbear. Again, the phototube has stepped in and stopped the waste. The system not only detects skew in minute values, but proceeds to correct the trouble so that the goods come out of the process "Photosquared."

Acres of steel, ten-thousandths of an inch thick are rolled for "tin" cans. Now and then pin holes appear and, if noticed, much steel is thrown away to be sure that no pin holes are included. When they are not noticed, the cans develop "leakers" and the canners are critical of the steel makers. Pin hole "detectors" now watch the wide strip steel as it goes through the process at high speed, and when pin holes appear, a knurling tool makes an unmistakable mark where the defect is located. In some cases, the holes are noted in the uncut strip, and a few seconds later the cut sheets are sorted automatically, the defectives being set aside.

By intelligent analysis the average electrical man in a plant can show the management dozens of these effective ways to eliminate waste.

***SOLDER WASTE**—An increase of 50 per cent in wattage at the tips of Hexacon electric soldering irons saved 25 per cent on time to solder delicate connector lugs to radio chassis at Emerson Radio and Phonograph Corp., N. Y.*



"3C" Bulletin 6030 A. C. Automatic, Reversing, X-the-Line Starters, Size DS-0 or DS-1, provide lots of space for wiring. Four concentric knockouts, top, bottom and back, and two concentric knockouts on each end. provide plenty of means for bringing in leads.

There's ample wiring space; the terminals are all easily accessible. There's no poking 'round in dark holes with a screwdriver when you wire this starter.

You can lift the whole mechanism out of the cabinet. Just remove the two screws at the top corners of the mounting plate; loosen the two screws in the lower slotted corners; slide the mounting plate up, and the whole mechanism lifts out.

Two "3C" Bulletin 7707 A. C. Contactors, mechanically interlocked by positive operating mechanism which prohibits simultaneous closing of the Contactors, are provided. Each Contactor has a normally open control circuit contact to provide for 3-wire Push Button operation.

Double Break, Silver-to-Silver Contacts—Hinged Arm Vertical Lift Magnet . . . exceptionally large electrical clearances—rugged mechanical design—easily accessible, large size terminals—these are a few of the many features of these sturdy Contactors.

Standard starters may be used where PLUG-STOP or JOGGING duty requires operation at a rate of less than five per minute. Modifications of these starters with additional electrical interlocks and reduced H. P. ratings are available in accordance with any NEMA MA-IC8-21 recommendations.

WRITE FOR FULLY DESCRIPTIVE BULLETIN

OFFICES IN PRINCIPAL CITIES

THE CLARK CONTROLLER CO.

1146 EAST 152ND ST. CLEVELAND, OHIO

Photoelectric Installation Saves Over $30 A Day

A recent installation of photoelectric control on doors of the shipping and receiving departments saves as much as $30 per day in operating costs for the Brown and Williamson Tobacco Co., Louisville, Ky. Substantial savings in heating costs are also being made.

With the shipping and receiving departments operating on a 24-hour-a-day basis, six huge doors must be continually opening and closing to allow for the passage of incoming loads of leaf tobacco and outgoing shipments of cigarettes and smoking tobacco. These doors were previously operated manually at comparatively high cost, both in actual operating expense and in time lost in signalling for the doors to be opened.

Previous expense of heating these departments was also very high because the doors opened directly to the outer air and the slow manual operation of them allowed much heat to be lost. In fact, the doors were sometimes allowed to remain open continually, there being no time to operate them. These facts not only resulted in higher costs, but also made it difficult to maintain comfortable working temperatures for employees of the shipping department.

Now, however, with the installation of General Electric photoelectric control equipment, incoming or outgoing shipments approaching the doors cut light beams focused on phototubes. Interruption of the light beam starts operation of the equipment; the doors open automatically and then close when the shipment has passed beyond the light beams. As a result, not only are operating time and costs, as well as heat losses, cut to a minimum, but also comfortable working temperatures for employees are easily maintained.

In addition to the four photoelectric relay and light sources, the G. E. equipment controlling each door includes one ¼-hp. concentric gear-motor; two limit switches for controlling the door's travel; a 500-watt, 220/110-volt, single-phase transformer; and supplementary control devices. A limit switch, mounted at the top of the door on a hinged panel is used as a safety device to protect against persons being caught in the door. This switch operates the control circuit and reverses the door.

No More Burned Bearings

A plant superintendent informs us of an arrangement which has eliminated trouble with burned-out bearings. It has been in operation for several years, and has made a remarkable record—only one burned out bearing in 135 motors.

Too much belt tension between motor and countershaft was the cause of the bearing trouble. Adjustments were made by department employees, and no one was penalized for a poor job.

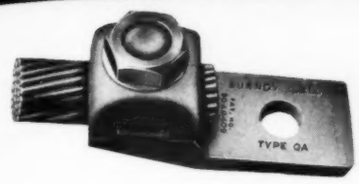
Now the electrician is responsible for all adjustments of belt tension. The usual method to take up slack is to move the motor on its rails or base plate. Shortening of the belt is done

***AUTOMATIC OPERATION** of six doors, similar to one shown, by photoelectric control and gear-motor made substantial savings in operating and heating costs.*

Connected!

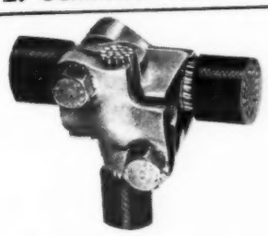
90% OF THI CONNECTIONS IN THE INDUSTRIAL LAYOU

Made with 6 BURNDY CONNECTORS

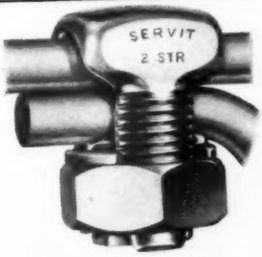


1. QIKLUG - QA

2. SCRULUG - KPA

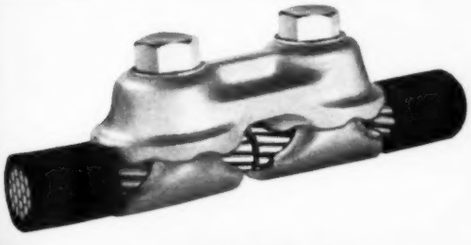


3. VERSITAP - QPX

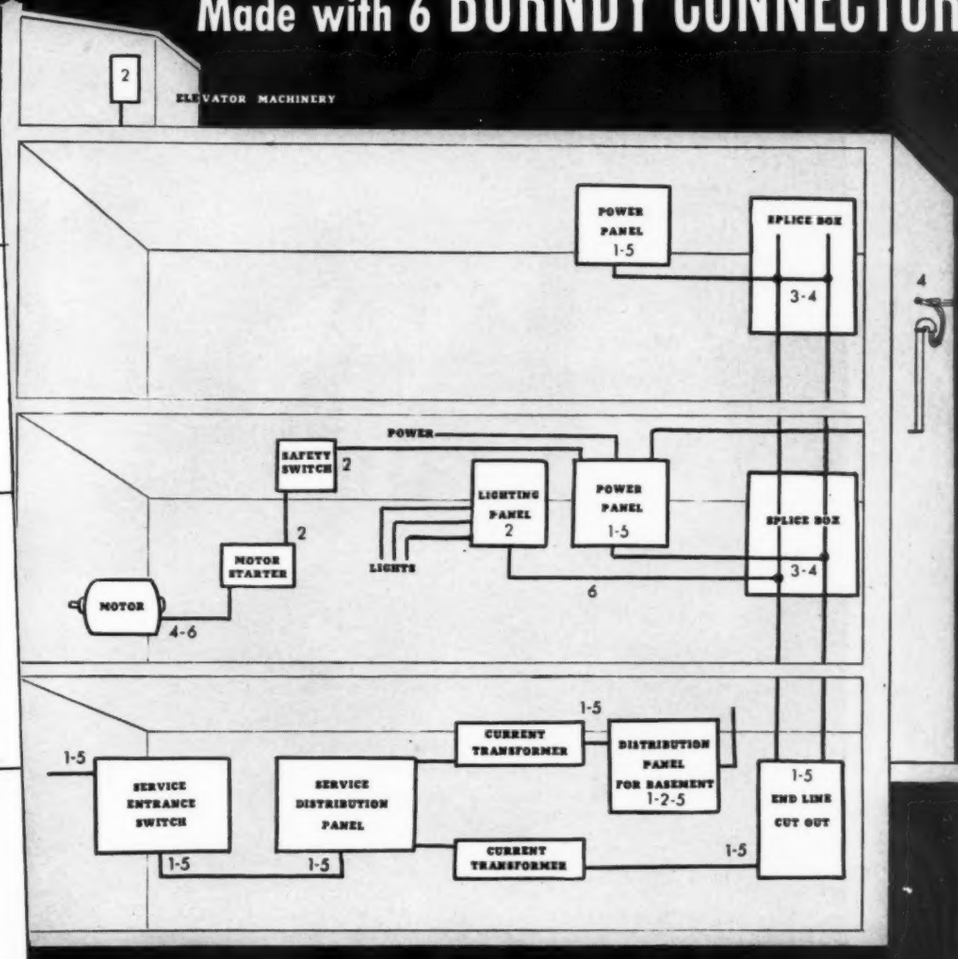


4. SERVIT - KS

5. VERSI-LUG - EA



6. VERSI-LINK - ER



The average* industrial wiring layout—a planned arrangement of switches and panels and wiring—requires a score of different connections, yet six Burndy connector types "hook it up" almost from basement to roof. From the service entrance switch to the last power panel they connect every part of the industrial layout. Burndy connectors are versatile not only in application, but take a wide range of conductor sizes too . . . so a small number of types and sizes *do the job*. Speed up your hookups—with Burndy Connectors!

Send for the handy **BURNDY** catalog

To the *Burndy* Engineering Co., Inc.
459 East 133rd St.
New York, N. Y.

Kindly send me a copy of the Burndy Catalog No. 41.

Name_____ Title_____

Company_____

Address_____

*On your *heavy duty* installations involving bus bar, channel bus, tubular bus, etc., get the connector data from Burndy.

These little "Inch-Mar

"Make Yards of Profits

WHEN YOU USE "INCH-MARKED"

PAT. APPLIED FOR

ELECTRUNITE Steeltubes

REG. U. S. PAT. OFF.

UNDERWRITERS' LABORATORIES, INC. INSPECTED RIGID ELECTRUNITE STEELTUBES REG. U.S. PAT. OFF. Z-48 ELECTRICAL METALLIC TUBING

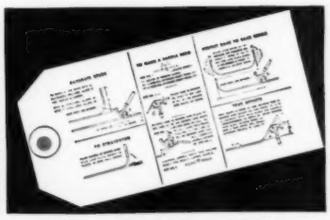
Thirty-six inch-marks on a foot-rule make a yard, but the little "inch-marks" on every length of "Inch-Marked" ELECTRUNITE STEELTUBES make yards and yards—*OF PROFITS*—for contractors who use this improved E. M. T.

Your mark for cutting a short length—or for making a bend—already is made for you—and made *ACCURATELY*. There's no slipping of foot-rule or pencil just as you are about to measure and mark the tubing — consequently, *LESS CHANCE FOR ERROR,* for cut lengths or bends that do not fit—and *LESS WASTE* of tubing on the job.

The new ELECTRUNITE Bender shown below—a one-piece casting with instructions built in—will help you lengthen your profit yardage, too. It was designed to enable you to use "Inch-Marked" ELECTRUNITE STEELTUBES to best advantage in making bends by hand, quickly and easily.

Tell your ELECTRUNITE Distributor that you want to use "Inch-Marked" ELECTRUNITE STEELTUBES on your next wiring job. (It's approved by the National Electrical Code for exposed, concealed or concrete installations.) Try it yourself. Ask your workmen how they like it. See what a world of difference a few "inch-marks" make—how much easier and more accurate they make raceway installation. See, too, how they save money for you and increase the yardage of your profits. Steel and Tubes Division, Republic Steel Corporation, Cleveland, O.

With this new ELECTRUNITE Bender you can make any standard bend more accurately, with less effort and chance for error than ever before possible.

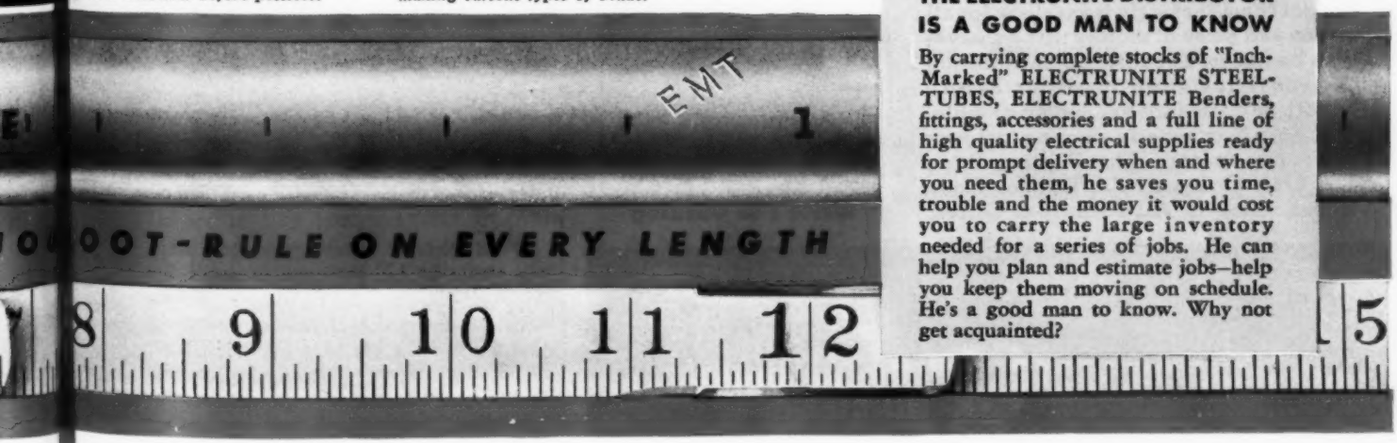


This new bending tag, supplied with each shipment of tubing, provides complete bending instructions and diagrams for making various types of bends.

REPUBLIC STEEL DEFENSE FOR AMERICA

THE ELECTRUNITE DISTRIBUTOR IS A GOOD MAN TO KNOW

By carrying complete stocks of "Inch-Marked" ELECTRUNITE STEELTUBES, ELECTRUNITE Benders, fittings, accessories and a full line of high quality electrical supplies ready for prompt delivery when and where you need them, he saves you time, trouble and the money it would cost you to carry the large inventory needed for a series of jobs. He can help you plan and estimate jobs—help you keep them moving on schedule. He's a good man to know. Why not get acquainted?



by a millright who is called in by the electrician.

The electrician is "on his toes." He knows that the belt must have the proper tension, otherwise he may have to do some hard work in a very short time.

Controlling Conveyor Speed

After parts which are to be covered with vitrified enamel are dipped in silicate of soda, at the American Stove Company, Cleveland, they are hung on a trolley conveyor which carries them through a drying oven. Without being taken from the conveyor, they are sprayed with enamel, and then passed through a high-temperature enameling oven.

The speed is varied according to the size of the parts passed through the oven and the temperature. Because the rate of travel is slow, a gear reducer slows the speed of the motor. To fit the needs of any particular lot, the travel is further controlled by means of a variable speed pulley. Thus any speed between 20 and 28 ft. per minute may be obtained.

"Electric Eye" Makes Control Automatic

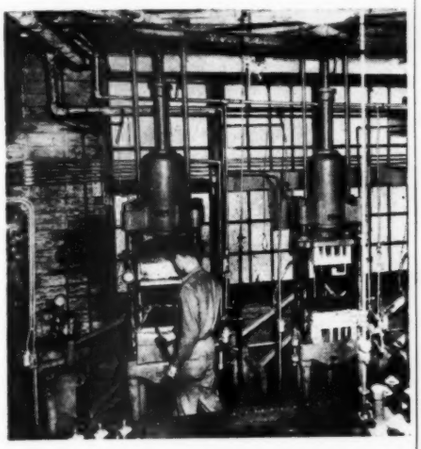
At the plant of the West Virginia Pulp & Paper Company, Piedmont, W. Va., photo-tube "electric eye" control keeps the individual motor drives on the paper coating machine operating at just the right speeds. The loop of paper between the coating rolls and the drier section must be maintained at a definite tension. Because of the wet condition of the sheet, a mechanical means of control is impracticable. Now, by means of the photo-tube system, if the loop becomes too long, the drier motor is speeded up; if too short, the motor speed is reduced.

Save $2,000 Annually on Steam

Four electric steam generators supply steam at 120 lb. gage pressure for heating the molds of large steam-jacketed hydraulic Bakelite presses at the plant of the Wagner Electric Corp., St. Louis. From four to six commutators are handled by the presses in six-minute heating and pressing cycles.

Formerly steam was supplied by a large remotely located oil-fired boiler. This boiler required constant attendance, and had to be operated even though only one press was required.

Now individual electric steam generators have been installed adjacent to each press. They were built in the Wagner plant and cost approximately



ELECTRIC STEAM GENERATORS
supply steam to these hydraulic Bakelite presses.

$800 installed, and supply steam when, as, and if needed.

Operation thus far has demonstrated an advantage not originally conceived. The mechanical qualities of the molded Bakelite have been improved because of more uniform temperatures. Another saving is made because the necessity of having an attendant has been eliminated. The electric boilers are automatic and are protected by lowwater cut-offs.

Arc Welders with Power-Factor Correction

One of the recent developments in welding equipment is the a.c. arc welder in 300- and 500-amp. sizes with built-in power-factor correction. By this feature power factor is greatly increased, which practically eliminates the useless lagging current drawn by conventional designs.

When operated below one-half load, the welder provides leading reactive kva. for improvement of the plant power factor. When operated at no load, there is 17.5 kva. available from the 500-amp. size for the same purpose.

Smaller primary conductors, line switches, and fuses can be used. This often results in a saving on installation costs. Also more welders can be added to the existing feeders without causing overload. Any tendency toward an unbalanced load is reduced by one-third.

Reader's QUIZ

QUESTIONS from readers on problems of industrial equipment, installation, maintenance and repair. Answered by electrical maintenance engineers and industrial electrical contractors out of their experience. For every question and every answer published, we pay $5.00.

CONDENSER LOAD

QUESTION 20—A synchronous condenser for power factor correction at its full load is approximately 400 amperes at 440-volts, 3-phase, 25 cycles. Its rating is 300 kva. I was able at first, to put the full load on the condenser by passing only approximately 53 amperes through the d.c. field. It now takes almost the full d.c. field load of 60 amperes to load it. Our power factor also seems to be suffering. Can anybody tell me why this is happening and what I can do to correct it?—O.R.F.

A. TO QUESTION 20. Two possible conditions would necessitate full-load d.c. field current in your synchronous condenser—short circuit between some of the turns of wire on the field poles, or a lower power-factor condition on distribution system, which may be due to lightly loaded induction motors. The condition of the field poles may be checked by applying d.c. voltage to the field, and measuring the voltage drop across each field coil separately. A coil having a lower voltage drop indicates short-circuited turns in that coil, and should be replaced. A field coil having short-circuited turns produces less flux per pole with a given number of amperes. Therefore, to maintain the same flux per pole, more current is required.—L.H.M.

A. TO QUESTION 20. I assume that the synchronous condenser is not delivering mechanical power. The full excitation may be required to compensate the lagging rkva of the inductive load. The lagging rkva may have increased due to addition of more inductive equipment or to decrease of load on your inductive equipment. Either case would increase the lagging rkva and for a constant power factor would require greater field excitation. —V.M.

A. TO QUESTION 20. This synchronous condenser trouble is a probable reaction of the behavior of synchronous machines operating on a bus with poor regulation. The machine takes sufficient power to supply its own losses which in this case, may be around 30 kw. If the constant and variable losses should decrease, due to factors affecting friction, windage and heat dissipation, together with poor feeder regulation, this condition would be present. The fact that a short circuit existing in the d.c. fields may also be a cause should be investigated. Check the power input at rated voltage with previous readings at as near unity power factor as possible. At this point there is no reactive power affecting operation. Check the fields. Factors involved in the source of supply such as stability of the power unit and consequent voltage regulation should also be checked.

There are many cases of over-motoring today and the consequent evil is poor power factor. It is also possible to over condense. If this is the case, the synchronous condenser capacity is too large for the feeder. The load variations in the feeder may affect the voltage to such an extent that a great change in the synchronous condenser excitation is necessary. It is advisable to study the load cycle of the feeder rather than concentrate on loading the synchronous condenser. A point may be determined whereby the excitation can be set to give favorable power factor correction without loading to full capacity.—O.A.

CORROSION

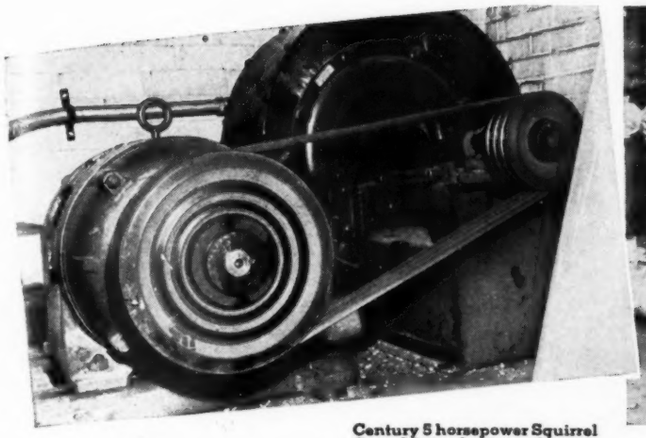
QUESTION 21. We have noticed that there is corrosion at a number of places where galvanized ground clamps are used on brass water pipe. At other places corrosion is not visible at the edges of the clamp and pipe. Can any one explain this condition and state how it can be avoided? Is there a small leakage current from the line through the ground connections?—S.R.M.

A. TO QUESTION 21. The trouble is due to using two dissimilar metals in a moist location. The reason that some show corrosion and others do not is because of the difference in the moisture at the location. Using brass ground clamps or grounding to galvanized pipe with galvanized clamps should correct the trouble.—L.S.W.

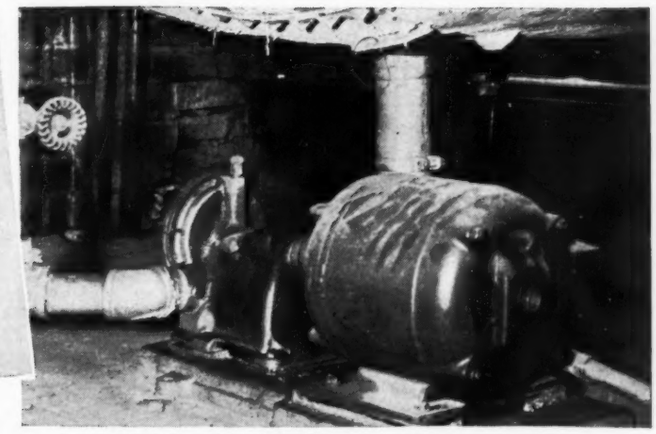
A. TO QUESTION 21. If all electrical connections were made up with oxidation protection, the condition noted between dissimilar metals in contact would not occur. I have had some experience with the "No-ox-id A" and No-ox-id Service Stores", as manufactured by the Dearborn Chemical Company, and would recommend some such product.—D.D.C.

A. TO QUESTION 21. A galvanized ground clamp on copper or brass pipe in the presence of moisture forms a short-circuited galvanic cell. The galvanic action causes decomposition of the metals and their appearance as encrustations of salts in the vicinity of the electrodes. Since moisture is essential, the condition can occur only in damp locations. It is not affected by the normal flow of current through the grounding connection. The condition cannot always be completely avoided but can be helped by thoroughly cleaning and drying the pipe and grounding fixture and applying petrolatum or asphaltum paint to the surfaces or wrapping the whole device with waterproof tape.—P.W.S.

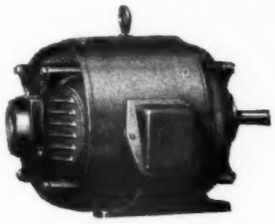
A. TO QUESTION 21. Electric current flowing through the ground clamp to the pipe or vice versa can cause this condition. Current generated by chemical action of the substances themselves can also cause corrosion. The latter cause is more apt to apply in this case because there is involved an assortment of substances such as iron, zinc, copper, and undoubtedly moisture from condensation of the water pipe or from the atmos-



Century 5 horsepower Squirrel Cage Motor driving a blower.



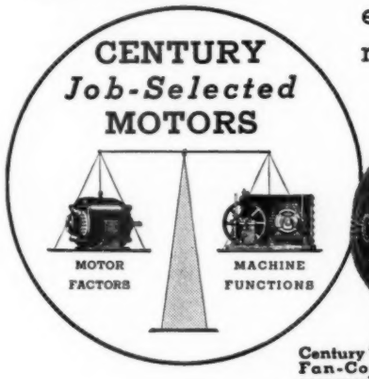
Century 1 horsepower Squirrel Cage Motor driving a pump.



Century Repulsion Start Induction Motor for hard-to-start loads.

Century Open Rated General Purpose Motor.

Century Splash Proof Motor protects against splashing liquids and falling solids.



How the CORRECT CENTURY MOTOR Contributes to Top Performance of ANY Job You Install

As a contractor, you're naturally interested in obtaining top performance from your installations—in giving your customers the best possible job. And when performance is influenced by electric motor drives, you can depend on Century recommended Motors every time.

Century Motors contribute to peak performance of any installation because they are designed and engineered to accurately meet the requirements of the machine and the conditions surrounding it. They are available in a wide variety of kinds, types and sizes—fractional and integral horsepower—to meet practically any application requirement.

Century Motors help you as a contractor—for you know in advance that a Century recommended Motor accurately meets the demands of the job. In effect, Century Motors make every contractor a motor specialist—for they make proper motor selection an easy task.

Let the Century Sales Engineer explain all the advantages of Century Motors—show you the profitable, business building opportunities for you in the electric motor field. Call him in today.

Century Totally Enclosed Fan-Cooled Motor for surroundings hazardous to ordinary motors.

CENTURY ELECTRIC COMPANY
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Century MOTORS

One of the Largest Exclusive Motor and Generator Manufacturers in the World

Reader's QUIZ

[FROM PAGE 66]

phere. These are substantial components of electrolytic action. Corrosion is a great evil in any industry requiring the use of metals. It is a complex electro-chemical action. A flow of current, or a transfer of electrons, however small, is always present.

Disconnect the ground wire from the pipe and test with a voltmeter for a difference of potential. If there is no perceptible deflection repeat the test with a milli-volt or a milli-ammeter. There should be no difference of potential between ground wire and pipe. Any existing current leakage becomes a distribution problem. It should either be eliminated or conducted back through a suitable low resistance copper ground.

It is possible that the corroded clamps have broken down chemically due to imperfections in manufacture, or have been distorted and cracked while tightening. This may be determined by replacing the defective clamps. If corrosion persists, clean clamps and pipe contact surfaces with any available volatile liquid, such as carbon tetrachloride, benzine, gasoline or alcohol. Tighten and if possible, solder clamps to pipe. Clean again, heat with a torch to remove moisture, and cover thoroughly with a substantial film of glyptal while hot, at a temperature of about 80 degrees C.—O.A.

RESIDUAL MAGNETISM

QUESTION 22. Is it true that the residual magnetism in the field poles of a direct-current generator, while standing idle, is of one polarity, whereas when this machine is run at full speed the polarity is opposite? And why is this so?—W.B.

A. TO QUESTION 22. No. Let us consider a self-excited d.c. generator. If the residual magnetism in the field poles is to change polarity, the magnetic field must be reduced to zero and then be built up again in the opposite direction. When the magnetic field is reduced to zero, generator action cannot take place and there will be no terminal voltage. Therefore, if the generator loses its residual magnetism while coming up to speed, it also loses its ability to generate and cannot build up a reversed residual magnetism.

In a separately-excited generator, the polarity of the residual magnetism is

determined by the external excitation. If the residual magnetism should be changed by reversing the direction of the excitation current, the polarity of the generator terminals will also change. —M.A.W.

A. TO QUESTION 22. The polarity of the residual magnetism in the field poles of a generator standing idle and the polarity of the field magnetism at full speed are the same. I think W.B., in checking field magnetism polarities, forgot to take into account the field distortion due to the reaction of the armatures. While carrying a load and operating at full speed, some generators may show an apparent change of sign at or near the heel of the poles which in reality is the sign of the distorted field of the preceding pole.—G.L.S.

A. TO QUESTION 22. The polarity of the residual magnetism in a self-excited d.c. generator when at rest and the polarity of its magnetism when up to speed and fully excited are the same. In order to build up a magnetic field of opposite polarity from that of the residual field it is necessary that the magnetism first decrease to zero before it can build up in the opposite direction. But as soon as this condition of zero magnetism is reached, the voltage in the rotating armature drops to zero and without voltage in the armature there can be no further action, that is—the machine is "dead".

The magnetism will only build up from its residual value to its full operating value when the armature voltage can send current through the field winding in such direction as to strengthen the magnetism in the generator which in turn raises the armature voltage which again strengthens the magnetism and so on—in a cumulative manner until the generator reaches a stable condition at which both magnetism and voltage become constant.—C.E.L.D.

A. TO QUESTION 22. This may be true in the case of a separately excited generator which has been idle for a considerable length of time. The polarity may appear to be reversed when in reality, the residual magnetism is probably reduced to zero value. This condition exists when the e.m.f. induced in the armature and applied to the fields is of wrong polarity. The momentary flow of current tends to reverse the residual and build up a field of opposite polarity. The period of actual reversal never appears because the field flux is reduced to practically zero value and the induced voltage in the armature is diminished in proportion. Even should the polarity of the fields become actually

Reader's QUIZ

[FROM PAGE 69]

reversed, the same condition will be repeated. The armature e.m.f. is reversed thereby and tends again to reverse the fields. Consequently, the generator never builds up.

There is a simple remedy for this condition; charge the fields with an external source, and proper polarity. Most self-excited generators are constructed with poles of fairly high retentivity. This means that the polarity of the residual will not change or diminish greatly of its own accord.—O.A.

Can You ANSWER these QUESTIONS?

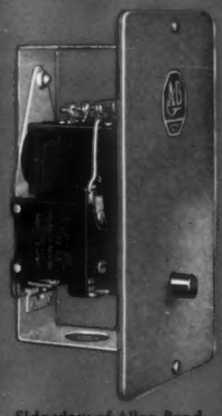
QUESTION V—Can someone tell me the reason why a compound wound motor, running at a constant speed and without a load, varies in speed to a slight degree when the brushes are shifted?—J.P.G.

QUESTION W—I have a d.c. fan which causes me much time and worry. I want to get a shimmy out of it, which I blame on the blades being out of line. I have tried many methods in lining up the blades but none have been successful. Please give any information on an instrument or methods I can use to put the fan in good running condition. This fan with many others has caused the loss of much time per fan. Any quick and simple method would be very much appreciated.—H.E.W.

QUESTION X—The exciter rings of a synchronous motor, running as a condenser, become black in certain spots and finally wear and cause sparking at the brushes. Changing polarity on the rings does not remedy it or different ways of starting and stopping. What should I do?—W.G

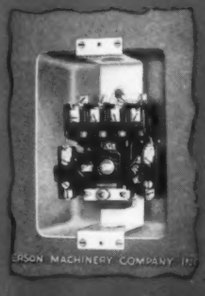
QUESTION Y—We have pilot lights on 440-volt, 3-phase ventilating fans. They are 250-volt 25-watt carbon lamps hooked up two in series on two phases. We wish to have only one lamp to a phase and just have a red glow in line with the operators' vision. Are neon lamps made to fit medium base sockets to show lights from 110 to 500 volts? As I recollect, these lamps have a low wattage drain and withstand vibration. This would save us power and annoyance because there are four lamps to a fan and a large number of them in the plant.—J.J.M.

PLEASE SEND IN YOUR ANSWERS BY OCTOBER 1



Side view of Allen-Bradley Bulletin 709 solenoid starter with flush mounting for machine panels.

ACROSS-THE-LINE STARTERS for Flush Mounting in Machine Frames



Front view of flush mounting starter in machine pedestal. Send for Bulletin 709.

"He says he tried everything but can't find any trouble in that starter!"

Of course he can't find any starter trouble. He is examining an Allen-Bradley solenoid switch, and all the old trouble-makers . . . pins, pivots, bearings, copper contacts, and flexible jumpers . . . are missing. They are not needed in the Allen-Bradley solenoid construction. There is only one moving part. That's why these solenoid starters are so trouble-free.

The double break, silver alloy contacts operate millions of times without any attention. They never need cleaning, filing or dressing. Just install an Allen-Bradley starter . . . and forget it.

Why not do away with all motor control maintenance worries in your plant? Specify Allen-Bradley solenoid starters . . . that's all!

A-B

ALLEN-BRADLEY

MOTOR QUALITY CONTROL

Allen-Bradley Company
1307 S. First Street, Milwaukee, Wis.

ALLEN-BRADLEY

SOLENOID MOTOR CONTROL

QUALITY

Some Good Rules For Fluorescent Lighting [FROM PAGE 27]

slightly overlapping the lamps, if the width of the trough suffices, or can sometimes be smoothed out by a diffracting collar of prismatic glass or plastic. Up to the 100 watt lamp size, a continuous end-to-end job runs 10 lamp watts or about 520 lumens per foot.

7. *Keep Fluorescent Lamps Away From Fixture Parts.* Do not place the lamps in contact with louvers or other fixture parts because mercury or its amalgams tend to condense at the contact points. This results in "flyspecking". Also, it is good practise to leave space for wiping the tubes occasionally. Of still more importance, if a deep metal reflector encloses one or several lamps in a confined space, the temperature of the lamp may rise above 120°F. This will slightly reduce candlepower.

Remember that fluorescent lamps, while giving off light, will not transmit light as in the case of a filament lamp bulb. Consequently avoid massing fluorescent lamps closely side by side or else provide individual reflector troughs for each lamp. Avoid trapping light in a deep trough so that it cannot escape from behind the fluorescent tube.

8. *Be Critical About Colors of Interiors.* The color of light from the average fluorescent installation will be different from the accustomed yellowish white color or filament lighting. So the first impression is that fluorescent foot-candles are more like outdoor light and are not as high as the metered value. This is another argument in favor of initially installing high foot-candle equipment.

Also the color of interiors is important and there is little sense in using daylight lamps in yellow painted interiors or soft white lamps in bluish green surroundings. Incidentally with filament lamp lighting, the job of getting different colors, as in the show window, involved a major operation with inefficient color screens and many units. With fluorescent display case or window lighting, where goods are changed and the scene approaches that of a small stage, it is well to have several sets of fluorescent lamps available for change in the sockets. Or three or four independent circuits of fluorescent lighting may be provided, such as daylight, soft white, pink and green.

In planning and estimating lumen and wattage requirements, rough out the "space" or general lighting jobs on about the following basis:

(A) From an open trough or industrial luminaire, some 70 per cent of the generated lumens reach the work or are useful. From the recessed ceiling trough, this figure is approximately 60 per cent. From the egg-crate or well-louvered office unit of direct-indirect design it would be 50 per cent.

(B) Since square feet of illuminated surface X average foot-candles = useful lumens; then useful lumens per sq. ft. = foot-candles. Consequently

(1) Add up the generated (rated) lumens of the fluorescent lamps used in the fixtures lighting the area.

(2) Apply the utilization or "usability" factor, given above in (A) or taken more exactly from published tables. The result is the useful lumens.

(3) Divide useful lumens by sq. ft. floor area. The result gives the average foot-candles.

In the average office installation, one watt per sq. ft. of floor results in approximately 15 to 20 foot-candles on the desks. The large industrial fluorescent jobs are generally on the basis of 2.5 to 3.0 watts per sq. ft. of floor area, and the "going" illumination averages 75 per cent of the new or initial values.

More Gossip

Sullivan Heads Lord Electric

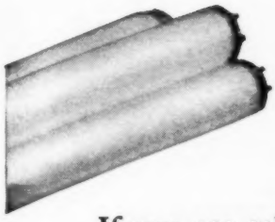
John J. Sullivan, who has been identified with the Lord Electric Company, Inc., of New York, Boston and Pittsburgh, for 25 years, was recently elected president of that electrical contracting organization. He succeeds Frederic W. Lord, who formed the company 46 years ago. Mr. Lord will continue actively in company affairs as chairman of the board.

Orderly Trucks

Careful planning can produce an efficient and compact rolling shop and stock room in a small truck body for repair calls and small jobs. But in daily use the truck can degenerate into a chaotic pile of miscellaneous materials and tools if the original plan is ignored.

Wm. R. (Bill) Henson of the Circle L Electric Co. in Tulsa, Oklahoma keeps "a place for everything and everything in its place" by a neat and brief set of instructions pasted inside the rear door. Not just a general order to keep the truck neat but specific rules for loading.

FLUORESCENT LIGHTING
all 6 advantages!



YOU'LL GET MORE fluorescent lighting business and find customers easier to sell when you handle G-E MAZDA F (fluorescent) lamps. That's because General Electric fluorescent lighting offers you all six of the selling advantages shown below.

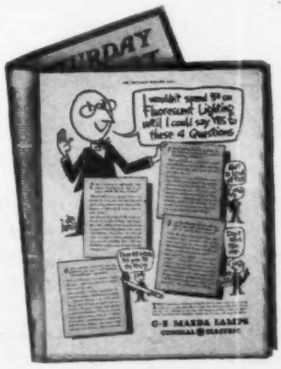
If you are selling G-E MAZDA F lamps, read about these six big advantages and ask yourself whether you are using all of them as profit points to make your selling more effective.

If you are not selling G-E MAZDA F lamps, it will pay you to find out what profit possibilities these lamps have for you. For complete information, see your nearest G-E Lamp Division office or write to General Electric Company, Dept. 166- EC-I, Nela Park, Cleveland, Ohio.

G-E MAZDA LAMPS

GENERAL ELECTRIC

Made to stay brighter longer



4. BIG NATIONAL ADVERTISING—There are more than 90,000,000 ad impressions this year—in such leading magazines as the *Saturday Evening Post, Collier's, Time, Newsweek,* and over 20 other business publications. All of them tell your customers of the advantages G-E Fluorescent lighting offers. That makes G-E MAZDA F lamps easier to sell.

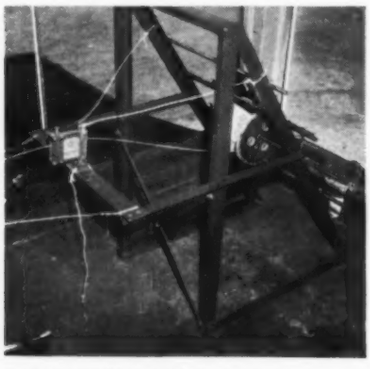
5. WIDE CHOICE OF FIXTURES—G.E. does not make fixtures for MAZDA F lamps but cooperates with many fixture manufacturers. For best lighting service, we recommend fixtures certified by Electrical Testing Laboratories, such as Fleur-O-Liers or RLM fixtures.

6. G-E ENGINEERING SERVICE—Fluorescent produces remarkable lighting results *when it* is properly installed. If you sell G-E MAZDA F lamps, you can draw on all of the engineering resources and knowledge of General Electric to assure the best possible job for your customer. G-E lamp engineers both at Nela Park and in the field will work with you toward that end.

Motor Shops

SPOOL RACK

The spool rack illustrated was designed and built by the Electrical Engineering and Service, Inc., Westfield, Mass., to support the spools of magnet wire during the coil winding operation. The rack is constructed of channel and angle iron and is triangular in shape with a horizontal bed supporting the wire tension device.



***TRIANGULAR SPOOL** rack accommodates up to fifteen reels of magnet wire, any of which can be easily removed by lifting the supporting rods from the pipe strap fasteners.*

The oblique side of the rack accommodates five steel bars supported by pipe straps and each of these bars will hold two or three spools of wire depending on the size of the spool. The tension device, which is pivoted on the horizontal frame, contains wood blocks that will accommodate six different sizes of wire simultaneously. Two bolts on the top of the device maintain the tension.

INFRA-RED BAKING TUNNEL

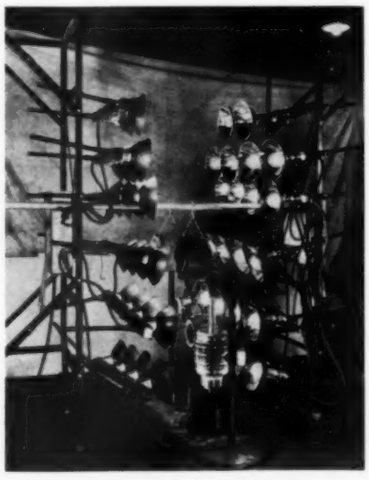
The B. A. Wesche Electric Company, Cincinnati, Ohio installed a 48-lamp infra-red baking tunnel in their motor repair department. They found that, in addition to reducing baking time, the tunnel installation reduced their insurance cost 14 cents per hundred, eliminated the necessity for ventilating fans and made possible the maintenance of a cleaner shop. Also, the old gas oven always had to be preheated to avoid condensation and it took from six to eight hours to bake an average job. Regardless of the size or quantity of material baked, the whole oven always had to be heated. Not so with the new baking tunnel—the number of lamps used depends on the size and amount of equipment baked.

To gain this flexibility of operation the forty-eight 250-watt, 115-volt drying lamps in gold plated reflectors are connected two in series on 220-volt circuits. Each group of two lamps is controlled by a separate switch.

The following is the baking time required for three-phase stators:

Stator Dia.	No. Lamps	Baking Time
Up to 8-in.	2	1 hr.
12-in.	4	1 hr.
16-in.	8	1¼ hr.
20- to 24-in.	16	1½ hr.

Armatures are supported on end with commutator down. For armatures of 11½-in. core diameter, eight-lamps are used for a period of 1½-hours.



***FLEXIBLE BAKING** with infra-red lamps is provided by this tunnel of banked units. Number of lamps used depends on size and quantity of equipment to be baked.*

This shop used this tunnel daily for nine months and finds that insulation does not become brittle and coils inside the slots are baked as thoroughly as the exposed ends.

PORTABLE HIGH VOLTAGE TEST SET

For testing insulation, grounds and short circuits in motors, Howard Davies, motor repair and test specialist of Philadelphia, Pa., uses a small test set which he built.

The set consists of a small 20 to 1 transformer, mounted in a case with a built-in series resistance and voltmeter with a 0 to 2000 volt scale. It is compact and comparatively light in weight so it can easily be transported from job to job. Primary voltage is single phase 110 volts while the maximum secondary voltage available is 2000 volts.

***COMPACT SET** for making high voltage tests on motors to discover insulation breakdowns, grounds and short circuits. Has built-in resistance and voltmeter.*

A CHAIN-BELT KINK

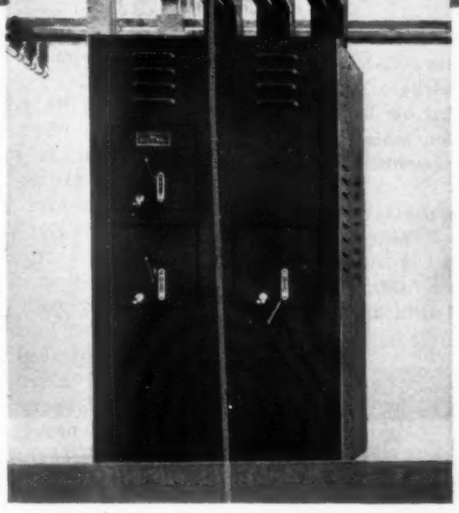
A silent chain broke. A new chain was unavailable and there were no repair parts on hand. So the mechanic ingeniously made a belt drive out of it by wrapping lengths of the silent chain around the sprockets and making them endless. That gave him fairly smooth faces on both sprockets and enabled him to use them as pulleys. In other words, the back of the chains became the surface of the newly devised pulleys.

The diameter of the sprockets was approximately 10- and 16-inches respectively, the diameters with the chain on, being about 1-inch greater. The width of the chain and also the belt was 10-in. The speed of the motor 900 r.p.m.; the horsepower, 75.

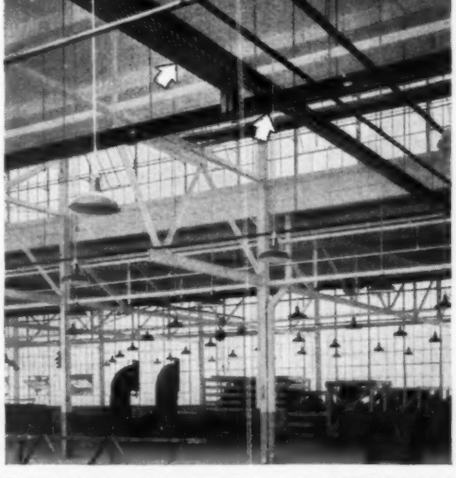
SPEED PRODUCTION

WITH BULL DOG BUSTRIBUTION DUCT

MAKES ELECTRIC CURRENT INSTANTLY AVAILABLE WHEREVER AND WHENEVER NEEDED



Above is an installation of BUStribution DUCT in a moderate sized automotive equipment plant. Note how the three feeder runs leave the Bull Dog SAFtoSWITCHBOARD, thence out in front and to the right into the plant as shown below. This installation included approximately 1,300 feet of BUStribution DUCT of 250 amp. to 750 amp. capacities, together with 256 Vacu-Break Switch Plugs.



DON'T hold up vital production for lack of ready power and light.

With Bull Dog BUStribution DUCT, the pioneer flexible electrical distribution, current is instantly available, at any time, exactly where needed.

BUStribution DUCT is available in two types, "LO-X" (Low Reactance Design) and "Plug-in."

"LO-X" BUStribution DUCT is used for high capacity feeder lines, also for welder circuits and other high inductive loads. "LO-X" is especially designed for greater current carrying ability, lower operating temperatures and less voltage drop due to reactance.

"Plug-in" type BUStribution DUCT, for short runs and branch circuits, permits tap-offs at one foot intervals. It includes circuit protective devices of the fusible switch or circuit breaker type.

Quick and easy to install, BUStribution DUCT permits expansion or rearrangement at any time, and is 100% salvable.

For complete information, write for illustrated bulletins. Better yet, ask for a call from a Bull Dog Sales Engineer.

Originators of Flexible Electrical Distribution Systems

BULL DOG ELECTRIC PRODUCTS CO.

DETROIT, MICHIGAN

Bull Dog Electric Products of Canada, Ltd., Toronto, Ontario

MANUFACTURERS of Vacu-Break Safety Switches, Panelboards, Circuit Master Panels, Switchboards, Duct Systems—FOR LIGHT AND POWER

Motor Shops

[FROM PAGE 76]

Using a diameter of 11-inches for the pulley motor I get a belt speed of about 2590 ft. per min. This speed for ordinary leather belting should enable a two-ply leather belt to transmit 62.75 hp. which is fairly close to the 75 hp. transmitted by the chain.

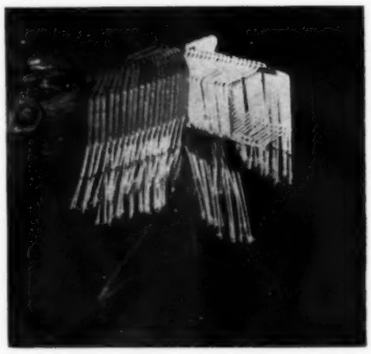
If a special tan leather belt were used, which is capable of transmitting 20 per cent more power than the ordinary variety we get 75.3 hp. In other words, if the maintenance man had had a special tan leather belt on hand he could have pulled full load—75 hp.

Of course, it is quite possible that the back of a chain when used as a pulley will not pull as much as a standard pulley. So far as I know, no comparative test has ever been made covering that point. But since strips of chrome inside of a regular leather belt will pull more than the original belt in direct contact with a standard pulley, I am inclined to believe that the reverse—strips of steel on special tanned belting—will also pull more. Anyway, the kink is very interesting and I believe it will prove valuable to others.—*W. F. Schaphorst, Newark, N. J.*

PORTABLE COIL RACK

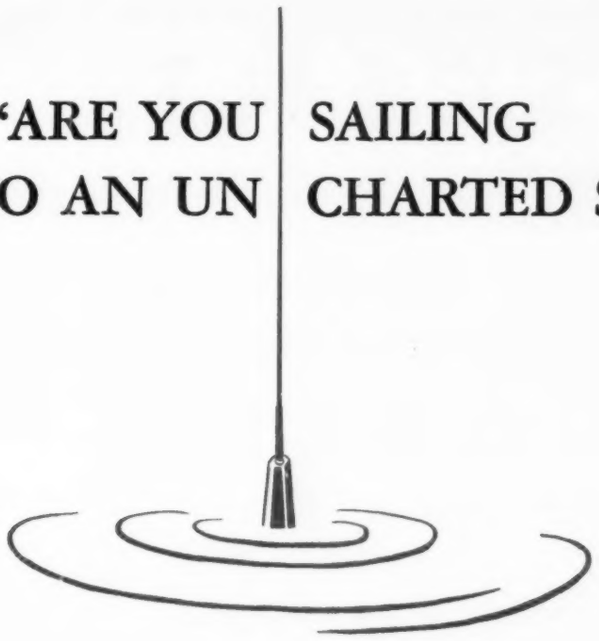
A handy portable rack for moving coils from one department to the other has been made and used by the Central Electric Company, motor repair shop of Bridgeport, Ohio.

The horizontal rack that supports the coils consists of two cross pieces of $\frac{3}{8}$-inch by $\frac{3}{4}$-inch flat iron, each 30-inches long and welded to a 32-inch length of 1-inch pipe which forms the



ROLLING ALONG on specially constructed portable racks, these coils pass quickly from department to department in this Ohio motor repair shop. Work is lightened and time is saved.

"ARE YOU SAILING INTO AN UNCHARTED SEA"



NEW USERS of electrical material for National Defense can steer clear of the rocks and shoals of inexperience by navigating their course with the help of a skillful T & B Distributor.

This seasoned pilot knows the regular channels of supply, and where to locate alternative material in jig time.

Since the great majority of his business today is Defense Business, he keeps up-to-date on priority rulings and knows the answers.

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Is it not likely that you, as one of the thousands of Electrical Contractors in this country, will find yourself sailing further and further into the deep waters of our National Defense?

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MANUFACTURERS OF ELECTRICAL FITTINGS SINCE 1899

T&B Distributors cover United States and Canada

Factory, Engineering and Executive Offices, Elizabeth, N. J.

Sales and Service offices in 23 leading cities

Motor Shops

[FROM PAGE 78]

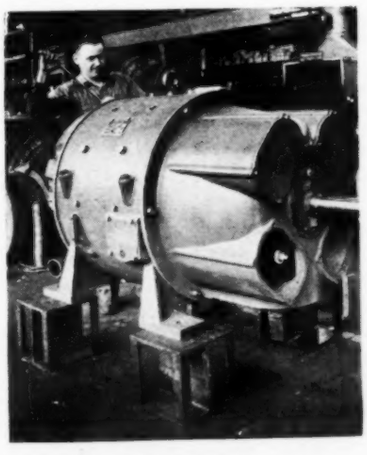
vertical support. The base of the rack is made of a similar steel cross, mounted on four casters. Both the base and the actual coil rack are braced to the center post by angle braces.

This convenient device can be used to transfer coils from the coil department to the dipping, baking or assembly departments and may even be rolled into an oven for baking the coils if necessary. The rack has carried a complete set of coils weighing as much as 300 pounds in total. It is a big time saver. This shop has constructed several of them for its own use.

STEEL ASSEMBLY BLOCKS

To facilitate the assembly of large and medium sized motors, Reliance Electric and Engineering Company, Cleveland, Ohio, uses a series of square steel blocks. They are 12-inches square and are made from a 12-in. by 12-in. I-beam cut in one-foot lengths. Light angles, welded in the four corners of each section of the I-beam block, give it uniform rigidity and facilitate its handling. The blocks are not too heavy to handle by hand.

These motor supports are used in one or two row levels depending on which height is most convenient for expediting the assembly operation. In general, medium sized motors rest on single rows and smaller motors on double height arrangements of the blocks. Safety, employee comfort and speedier assembly operations result.



SPOTTED ON BLOCKS made from 12-inch I-beams, this motor is at a convenient height for easy and speedy assembly. Eliminates stooping and crouching necessary when motor rests directly on the floor.

Estimating

LIGHTING CHANGES

On an installation of fluorescent lighting fixtures to replace a direct incandescent job, the new units replaced hangers and glassware weighing approximately three pounds each attached to the cover screw lugs on the outlet box. To provide additional strength to support the much heavier fluorescent units it was necessary to install fixture studs in the existing boxes.

The boxes were roughed in a slab and could not be readily removed. Four holes were drilled in the back of the box, tapped for 10/24 screws, and the fixture studs attached. Fixtures weighing 18 pounds each were hung in the usual way and connected to the existing wiring.

The labor breakdown on this installation was as follows:

Wiring 28 fixtures ready for hanging.. 21 m.h.

Installing 28 fixture studs in existing boxes using an electric drill and hand tap..23 m.h.

Installing and connecting 28 fluorescent fixtures weighing 18 pounds each on a 13 foot ceiling .....37 m.h.

Cost of supervision and lost time is included in the above figures.

Data from Premier Electric Construction Co., Chicago, Ill.

GROUNDING

Transformers, incoming conduit and a switchboard frame were grounded by a 1 by ¼-inch open copper bus as part of a new service installation in a factory building near Chicago. Three transformers were mounted on a concrete pad on one side of the vault. Incoming service conductors entered in conduit terminating in a pothead. The secondary circuit extended to a switchboard in an adjoining room.

The copper grounding bus started at the new entrance conduit, extended along the wall back of the transformers, through the partition into the switchboard room and up to the ceiling to a water main.

A total of 60 feet of 1 by ¼-inch busbar was used supported at four foot intervals on ¼-inch bolts anchored in lead shields. The bar was bushed out one inch from the wall. Lugs and 1/0 bare conductors connected to the transformer casing and the switchboard frame. A 4/0 conductor connected to the switchboard neutral bus.

Labor records were kept separately on the grounding work and the following figures derived.

Layout time including measurements and locating supports .....3.5 m.h.

Installing two 3½-inch ground clamps including cleaning pipes.....2.0 m.h.

Setting 15 lead shields in ordinary concrete and masonry walls.....3.5 m.h.

Drilling 25 holes for connection and supports in ¼-inch busbar including tapping for ¼-inch lug bolts.....9.0 m.h.

Making up and installing 3 links for transformer cases and 2 for switchboard with solderless lugs .....4.5 m.h.

Handling and installing 60 feet of busbar on bolts after shields are set and holes drilled .....2.0 m.h.

The figures given include an allowance for general supervision and other similar factors including lost time.

***SURGE PROTECTION** at entrances to grain elevators protects expensive electrical apparatus, says E. A. Jones, of Jones Electric Machinery Company in Topeka, Kan. The combination of choke coil and surge capacitor, which this company has installed in many Kansas elevators, blocks and absorbs the dangerous steep front surge before it reaches motors and controls.*

REVAMP OVERLOADED POWER SERVICE

The Lawrence Electric Company of Yonkers, N. Y., recently encountered a type of job that is common throughout the country today. They were called in to revamp a 400 ampere 220 volt, 3-phase power service in a steel fabricating plant. Approximately a 100 per cent overload condition existed.

The work consisted of removing an old 400 ampere free standing type switchboard, installing a new 1000 ampere main disconnect switch, an 800 ampere distribution panel, a new lighting disconnect switch all in a compressor room; also replacing the existing secondary power feeder consisting of three No. 500,000 cm Code type cables with No. 4/0 Type RH cables, three per phase leg, pulled into the existing underground conduit from the transformer vault approximately 50 feet from the main panel. Two new feeders of three No. 4/0 and three No. 3/0 Type RH cables were installed from the vault to controls for a 75 hp. compressor motor and welder circuits. The entire secondary rack of the transformer vault was revamped. A 60 hp. outdoor crane circuit was tapped to the transformer secondary. Miscellaneous circuits were connected to the new panel.

The following is a labor breakdown kept by the contractor for future reference. All work, with the exception of the actual connections to the three 75 kva; 2200/220 volt transformers, was done while the plant was in full operation.

REMOVING OLD EQUIPMENT—including the following:

Switchboard, including cutting existing 4-foot conduit risers 18-inches below concrete floor. Two men required.

Total time .....21.0 m.h.

Existing feeders, consisting of three 500,000 cm. cables in a 50-foot run of conduit embedded in the floor. Five men were used.

Total time .....10.0 m.h.

INSTALLING NEW EQUIPMENT—including the following:

Main disconnect switch of 1000 ampere capacity with link fuses, mounted on a wood backboard. Four men were used.

Total time .....6.0 m.h.

Distribution panel of 800 ampere capacity, containing 1-400 amp., 3-200 amp., 2-100 amp. and 1-60 amp., 3-pole fused switches. includes building and mounting wood backboard. Four men were used.

Total time .....12.0 m.h.

Welder switch of 400 amp. capacity, including mounting and connecting conduits. Two men were used.

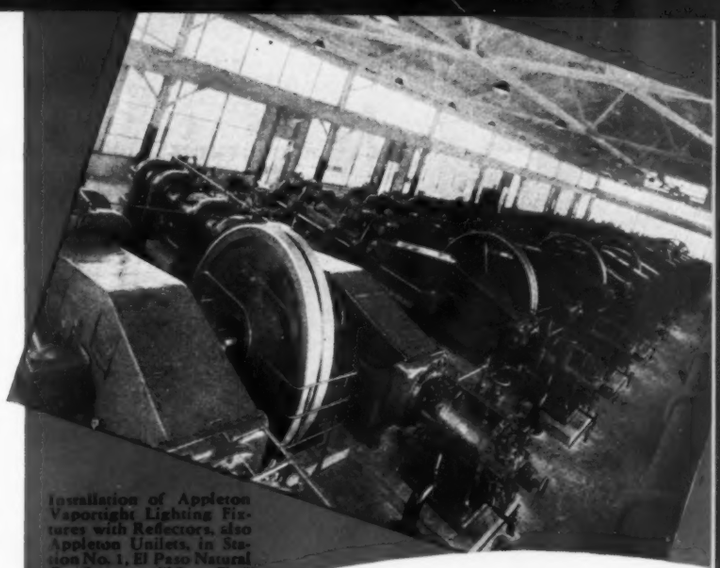
Total time .....3.0 m.h.

INSTALLING CONDUITS — includes the mounting of the following conduits:

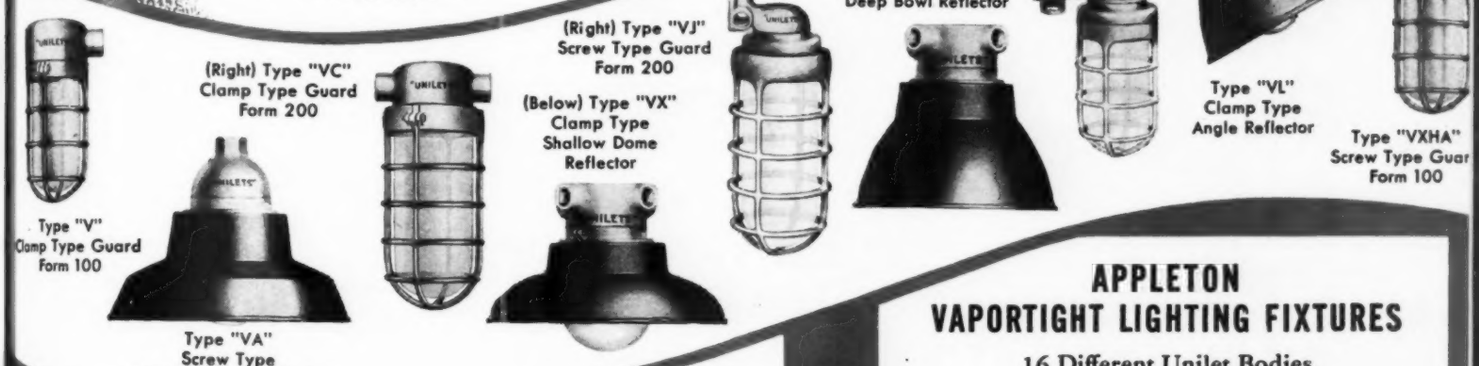
Compressor and welder feeders, consisting

OVER 50,000 Different Lighting Combinations

In This One Appleton Series Alone



Installation of Appleton Vaportight Lighting Fixtures with Reflectors, also Appleton Unilets, in Station No. 1, El Paso Natural Gas Company, El Paso, Tex.



That's How Well the Appleton *"Complete Line"*

Fits Exactly Every Fitting and Lighting Need

Not only does the Appleton line include conduit fittings, outlet and switch boxes and fixtures of every type, but all are offered in a range of sizes and variations that blankets every installation requirement, no matter how unusual. In Vaportight Lighting Fixtures alone, the possible different combinations number well over 50,000—and this is only one of Appleton's major series.

That is why electrical contractors save time and money by specifying this one dependable source of supply for every fitting they need on every job. They know from experience the vast Appleton line includes exactly what they order, that it will be right, mechanically and electrically!

You, too, can save time and money by specifying APPLETON FITTINGS—"STANDARD FOR BETTER WIRING!"

SOLD THROUGH WHOLESALERS

APPLETON VAPORTIGHT LIGHTING FIXTURES

16 Different Unilet Bodies
Each Adaptable to 2 Sizes
Each to Fit 2 or 3 Conduit Sizes
Each for Screw or Clamp Type Guards
Each Globe Available in 9 Colors
Each Furnished With or Without Toggle Switch
Each Furnished With or Without Lamp Grip

And in Addition:

Six of the 16 Unilets are suitable for use with any of five different reflectors!

The Number of Different Combinations is Amazing!

APPLETON ELECTRIC PRODUCTS REG. U.S. PAT. OFF.

The name "Appleton;" the registered trade-mark, "Unilets;" or the famous circle-A Appleton trade-mark shown above, appears on every Appleton fitting. *We manufacture no private brand goods!*

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APPLETON

CONDUIT FITTINGS • OUTLET AND SWITCH BOXES • EXPLOSION-PROOF FITTINGS • REELITES

Estimating

[FROM PAGE 82]

of 52 feet of 2½-in. and 48 feet of 2-in. conduit mounted on wood, 10 feet above the floor, from vault to switches. Includes cutting hole, by hand, through an 8-inch concrete wall. Three men were used.

Total time .....41.0 m.h.

Cutting existing conduits and terminating them in a 36-in. by 18-in. by 12-in. underfloor pull box; also extending 3-ft. risers to the new panel. Includes digging for pull box. Two men were used.

Total time .....20.0 m.h.

Rerouting 15 feet of conduit from old to new 200-amp. lighting switch location, including mounting switch, pulling wire and making connections. Two men were used.

Total time .....8.0 m.h.

PULLING IN WIRE—includes the installation of the following circuits:

New main feeder of nine No. 4/0 Type RH cables in existing 55-ft. run of conduit. Five men were used.

Total time .....9.0 m.h.

Connecting the nine No. 4/0 feeders to the line side of the main switch. One man worked with solderless connectors, including making necessary copper extensions to switch lugs.

Total time .....6.0 m.h.

Distribution panel subfeeders, including the installation of cables and all connections from main switch and underfloor pull box; also splicing panel extensions to existing subfeeders in box. Two men were used.

Total time .....26.0 m.h.

Compressor and welder feeders, including the installation and connection of three No. 4/0 and three No. 3/0 Type RH wires for an average of 50 circuit feet. Three men were used.

Total time .....16.0 m.h.

VAULT WORK—includes the following work on the transformer secondaries:

Removing existing 500,000 cm. delta connections mounted on porcelain cleats. One man required.

Total time .....3.0 m.h.

Fabricating and mounting three 12- by 8- by 6-inch open bottom fibre terminal boxes with a drilled and tapped connection bus in each. One man used.

Total time .....14.0 m.h.

Fabricating and mounting three 24- by 7- by ⅝-inch fibre insulating blocks with holes drilled to hold the new transformer secondaries. One man used.

Total time .....10.0 m.h.

Running feeder wires through the insulating blocks, shaping, cutting and making the 24 solderless lug connections in the terminal boxes. Two men were used.

Total time .....15.0 m.h.

Wrapping the grouped secondaries with marlin cord and painting same. One man was required.

Total time .....8.0 m.h.

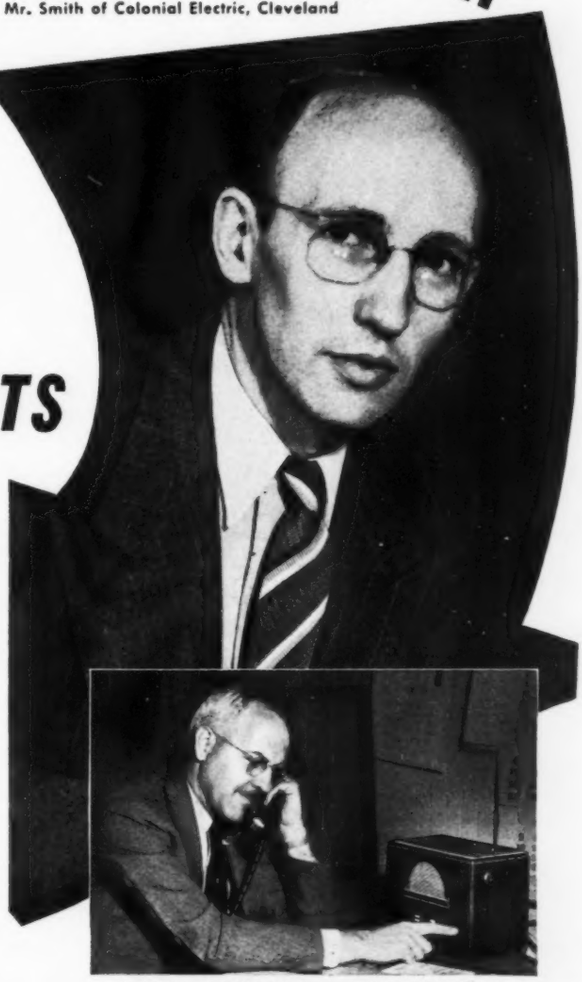
Data from Lawrence Electric Co., Yonkers, N. Y.

"Just a ROUTINE SALE" to J. B. Smith

as Mr. WEBSTER ELECTRIC teletalk

REG. U. S. PAT. OFFICE

ROLLS UP THE PROFITS



Mr. Smith of Colonial Electric, Cleveland

● Mr. Smith shoved back in his chair and smiled when we asked him how he sold a Teletalk System to the Perry-Fay Company of Elyria, Ohio. Mr. J. B. Smith is the dealer who operates the Colonial Electric Company, Cleveland.

"Just another sale from our routine of calls and follow-ups—we used other Teletalk installations in Cleveland as references," said Mr. Smith. He was quite modest and complacent about it . . . but just between you and me he HAS been "ringing the bell" lately with Teletalk sales—the cash register bell.

Take this Perry-Fay job for instance . . . a 212M Teletalk, five 105M Teletalks and a 5A45 Teletalk speaker-microphone; not to mention the wire, cable and other materials used to install them.

Nice business—*profitable* business—the kind of business YOU could be getting if you take the trouble to go after it. Send for a Teletalk Catalog today and get your share of these worthwhile profits.

C. J. Robinson, Sales Manager of Perry-Fay Company of Elyria, finds Teletalk a real help in improving customer service and increasing plant efficiency.

The shipping clerk reports instantly over Teletalk just when shipments are to be forwarded.

Licensed by Electrical Research Products, Inc., under U. S. Patents of American Telephone and Telegraph Company and Western Electric Company, Incorporated

WEBSTER ELECTRIC CO., Racine, Wis., U.S.A. Est. 1909. Exp. Dept.: 100 Varick St., N.Y.C. Cable Address: "ARLAB" New York City

WEBSTER ELECTRIC

"Where Quality is a Responsibility and Fair Dealing an Obligation"

MANUFACTURERS OF TELETALK INTERCOMMUNICATION AND PAGING SYSTEMS • POWER AMPLIFIERS AND SOUND DISTRIBUTION EQUIPMENT • RADIO PHONOGRAPH PICKUPS • IGNITION TRANSFORMERS AND FUEL UNITS FOR OIL BURNERS


NOW you can buy
FOR INCOMING LINES
FOR 3-PHASE 3-WIRE 60-CYCLE
FOR FEEDER CIRCUITS
FOR 2300-VOLT CIRCUITS

...your metal-clad switchgear...

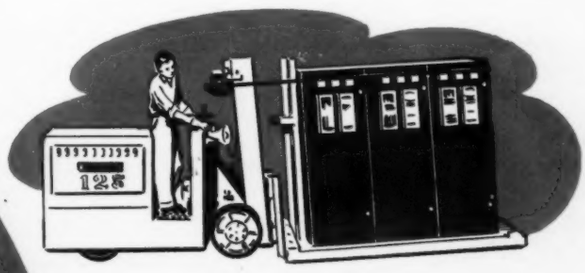
"RIGHT OFF THE SHELF"

WHEN you need switchgear these days, you want it in a hurry. So we've made it almost as easy to get as picking your favorite coffee off the market shelf. Shipping time for standard low-capacity Type MI-9 metal-clad equipments up to 2300 volts, for protection of incoming lines and feeder circuits, has been reduced from several months to 4 weeks.

And they are delivered in a "package," all ready for you to roll into place and connect the cables.

Again General Electric takes the lead. Only last year we reduced prices 25 per cent on these small and medium-sized equipments. Now, as a contribution to America's big job of getting more *defense* plants ready for production in a hurry, we have speeded up delivery 300 per cent.

Get your switchgear when you need it, this new, easy way. We have sub-assemblies ready and waiting for final assembly, co-ordination, testing, and packing. Just place your order with your G-E representative and we'll do the rest. General Electric, Schenectady, N. Y.



Play Safe with
G-E METAL CLAD

GENERAL ELECTRIC

Estimating [FROM PAGE 84]

MASS PRODUCTION OF CONDUIT SECTIONS

The lighting installation in a large commercial building recently wired by the Hixon Electric Co., electrical contractors of Boston, was of the grid type concealed in a suspended ceiling. This meant that all of the outlets were spaced equal distances apart throughout the entire floor area. All conduits entered the tops of the outlet boxes from the same elevation.

This arrangement lent itself readily to mass production of the conduit section between the outlets. Each section consisted of two bends and one coupling. With this in view, a bending mechanism consisting of a half-moon bending shoe mounted at the top of an inclined-plank platform was set up. A guide hole adjacent to the shoe received the vertical lengths of ¾-inch conduit. The mechanic, standing on the inclined plank, bent the conduit around the shoe with a 1¼-inch, 5-foot sleeve cut out to slip over the protruding length of conduit. Full lengths of conduit to be bent were stacked adjacent to the bending platform.

The bent sections were then cut to length, threaded and coupled into complete sections. A power cutter and threading machine were used.

The following time was required to make these sections, based on making them up in groups of fifty or more. Three men were required for the complete operation, one on bending, one on cutting and threading and one on assembly.

BENDING THE CONDUIT—covers the time actually spent in the bending operation.

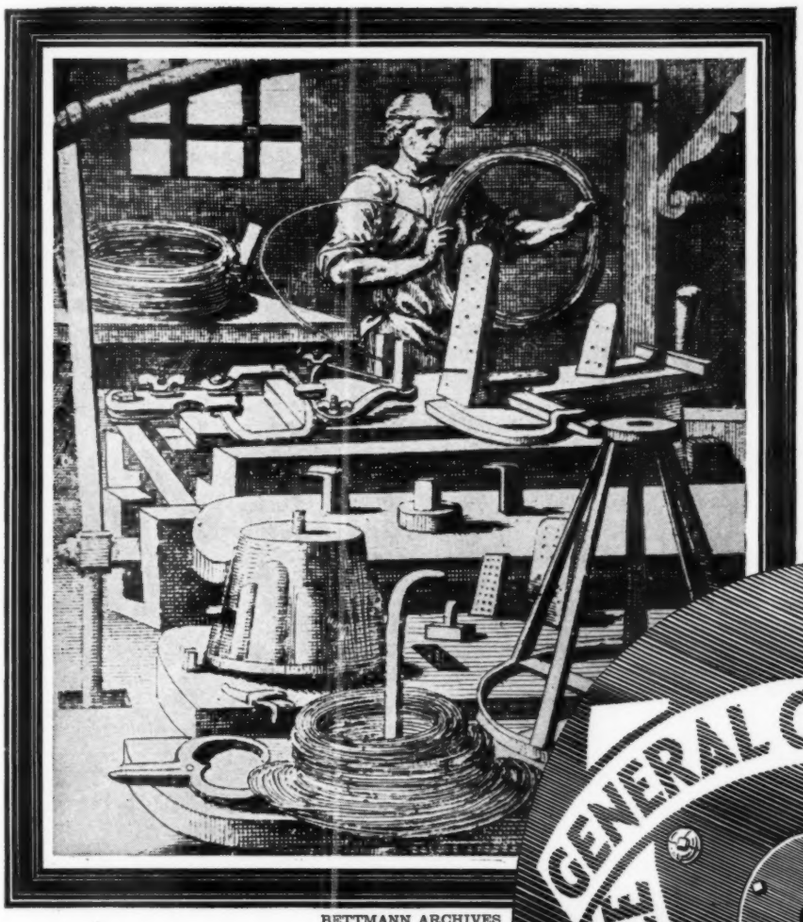
Total time for 50 bends.....	20.0 minutes
Average time per bend.....	0.4 minutes

COMPLETE FABRICATION—includes making the two bends, cutting, threading and assembling a complete conduit section. Covers the total time for the three men.

Total time for 50 sections....	3.0 m. h.
Average time per section.....	0.06 m. h.
or	3.6 minutes

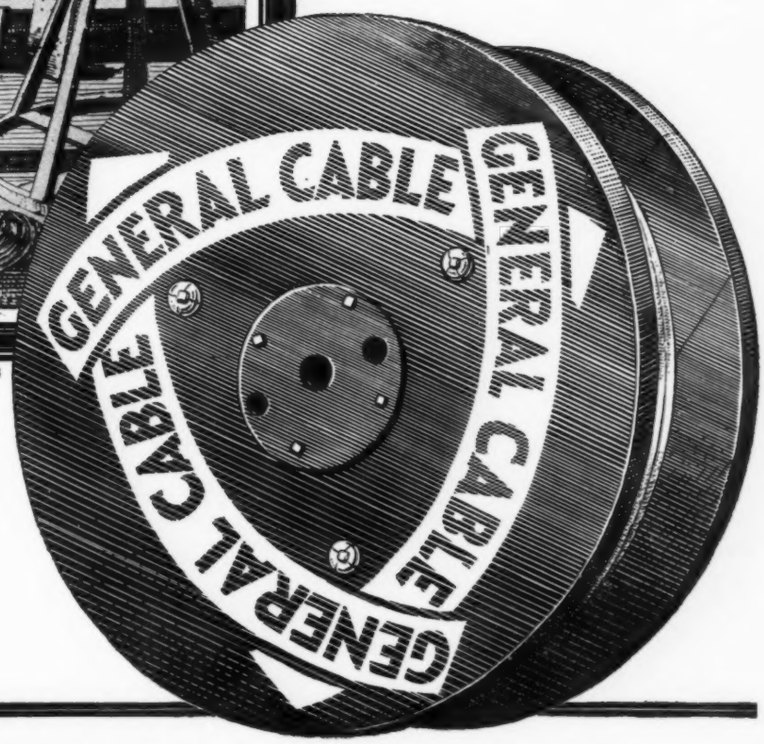
All sections were made up in one corner of the building and bundles of completed sections were transported to the working areas. The above units are presented simply as a guide to the labor required under mass production methods. Naturally, each particular installation has its specific job conditions and equipment. These must be considered when applying the above units.

FOUR HUNDRED YEARS AGO, for wire of quality one sought out an individual reputed to be a superior craftsman. In these days of vast manufacturing enterprise, reputations are just as solidly built and for similar reasons. Of General Cable, it has now been custom for two generations to expect and receive quality in product and in service.



BETTMANN ARCHIVES

Here preserved in copperplate engraving is the wire-drawing shop of the 17th century. Chances are that a good part of the product was of the same all-useful red metal.



GENERAL CABLE

BARE and INSULATED WIRES and CABLES for EVERY ELECTRICAL PURPOSE

STOCKED BY ELECTRICAL WHOLESALERS EVERYWHERE

General Cable Corporation Sales Offices: ATLANTA • BOSTON • BUFFALO • CHICAGO • CINCINNATI • CLEVELAND • DALLAS • DETROIT • HOUSTON KANSAS CITY (MO.) • LOS ANGELES • NEW YORK • PHILADELPHIA • PITTSBURGH • ROME (N.Y.) • ST. LOUIS • SAN FRANCISCO • SEATTLE • WASHINGTON (D.C.)

Questions ON THE Code

Answered by
F. N. M. SQUIRES
Chief Inspector New York Board of Fire Underwriters

Sealed Conduit

Q. *"Each building in a housing project is supplied by Type RW wire in rigid conduit installed underground from a pole and terminates in a junction box in an accessible crawl space under the first floor slab in each building. The question is whether under Article 2314 in the Code, the conduit terminating in the junction box is required to be sealed with compound. We believe that Article 2314 applies to a service conduit from underground distribution system and not where the conduit originates from a pole."*—M.A.E.

A. Article 2314 requires that where a service conduit runs from an underground distribution system into a building, the conduit entering the building shall be sealed off.

This rule, however, does not apply to service conduit which does not originate from an underground distribution system. Therefore, where the service conduit runs from pole line, no sealing is necessary.

Motor Trouble

Q. *"I have a little motor trouble that I would like you to give me the correct information on.*

"There is a party here that has one 25 hp., one 15 hp., one 10 hp. and one 3 hp. motors, all of them 3 phase 220 volts. They are in first class condition, no bearings are worn or loose.

"When you start the 10 or 15 hp. motor and they are running and then go to start the 25 hp. motor it will stop either one of these motors. There is a No. 3 wire to the 25 hp. motor and a No. 4 wire to the 15 hp. motor and a No. 6 wire to the 10 hp. motor and none of these motors are over 35 feet from the main entrance switch. Also there are three No. 1 wires leading from the outside of the building into the main entrance switch, but these wires are short, only 4 feet in length.

"My theory is that the line from the transformers to the main entrance switch is too small. Am I correct on this or is there more trouble some place else? The supply wires from the house to the transformers are, No. 4 wires for 150 feet from house to pole and thence No. 2 wires for 200 feet to the transformers."—C.K.

A. The service for this group of motors installed, as it probably was, under the 1937 or previous Code should have been at least No. 000 wire and yet a combination of No. 4 and No. 2 wire is indicated. Undoubtedly the trouble is due to excessive voltage drop because of the 350 feet run of the small size supply line. Added to this may be low capacity in the transformers.

If the transformers are of sufficient capacity, then by connecting them for enough over-voltage to deliver 220 volts at the service, the supply wires could be (under Table 2 of the 1940 Code) No. 0 wires inasmuch as they are overhead and free in air.

POINTED DISCUSSIONS. Paul Geary Washington, D. C. lends an attentive ear to an important point W. J. Quinlan of Rochester is making. It all took place at a between-the-session huddle at the recent convention of the New York State Association of Electrical Contractors and Dealers at Saranac Inn.

A Grounding Problem

Q. *"In a factory wiring system the following has been proposed:*

"A bank of transformers located outside the building will be fed from the utility company's 3-wire, 3-phase 4600 volt line, which is ungrounded. The secondaries of these transformers will feed the main switchboard, through a main entrance switch, at 440 volts, 3-phase, 3-wire, the transformers being connected in delta. From the main switchboard feeders will go to 3-phase, 440 volt, 3-wire panelboards for distribution of power circuits to motors. From one of the branches on each of these panelboards a single phase circuit will feed a 440-volt to 110/220-volt air-cooled, two-winding transformer, from whose secondary feeders will be run to lighting panelboards supplying lighting and receptable circuits. The lighting transformers will be staggered on different phases of the power line to balance the load. Panelboards will, of course, be located on different floors and some distance apart.

"(1) With such a system, is it possible to provide system grounding to reduce accident hazard on the 110/220 volt circuits?

"(2) If no system ground is provided, is there any Code violation?"—J.W.S.

A. (1) Yes, the neutral of the secondary of each 440 to 110/220 volt step-down transformer can be grounded. This should be grounded at each transformer or on the supply side of the main switch controlling the lighting panelboard. This is required by Code rule 2526.

(2) Yes, Section 2514 of the Code requires that interior alternating current wiring systems be grounded in a case such as this.

Conduit In Cinder Fill

Q. *"Rule 3463 of the Code states that conduit shall not be used in or under cinder fill where subject to permanent moisture. The question is*

PLUGS

THAT SPEAK FOR THEMSELVES,
NOT BY WHAT THEY SAY BUT
BY WHAT THEY DO –

After blowing

C-QUICK

Glass top, complete insulation. Rating reads by color and figure in any position. Link parts on overload, glass blackens on short circuit; each equally easy to detect. White link on black background; highest visibility before and after blowing. The supreme quality in plug fuses.

BLAC-LINK

Porcelain base, heavy brass cap, large clear mica window. Black link, white background; highest visibility before and after blowing. Link parts on overload, window blackens on short circuit; each equally easy to detect. ***Plug fuses have no moving parts—assured protection.***

Ask your dealer, or write for our Bulletin 404.

THE CHASE-SHAWMUT COMPANY
NEWBURYPORT, MASSACHUSETTS

FUSE MAKERS SINCE 1893

Questions on the Code

[FROM PAGE 90]

what comprises a permanent moisture condition.

"For example:—I have a warehouse job where no excavating has been done. The ground is level with the sidewalk but the floor of the warehouse is four or five feet above the existing grades to provide a loading platform. This four or five feet is to be filled with cinder fill and concrete floor on this.

"Would this be considered a permanent moisture location regardless of the fact that it is under roof? Does cinder fill in contact with any earth comprise a permanent moisture location even though it is under the roof of the building and grading has been done to carry surface rain water to the street gutters?

"Also under the auditorium of a school is not excavated. Cinders have been used to level off with. Can conduit be run under this floor? The building is located on a hill in a perfectly dry spot. Of course, I mean without covering the conduit with concrete."—O.A.T.

A. The question as to whether or not the cinder fill under a building is or will be permanently moist must be left to the local authority as the problem is a local one.

In general, the earth under a building is very dry but in some locations, because of drainage and climatic conditions considerable moisture does seep into the ground beneath a building.

In the case of the warehouse cited above, inasmuch as the cinder fill has been put on top of the grade and especially as drainage has been provided for the surface rainwater, the cinder fill certainly should be dry unless the location is in a valley or other low spot where the underground water table is very near the surface.

With the school auditorium job, apparently this would not present a moist condition for any cinder fill.

Therefore, in both of these cases it should be permissible to install the conduit in the cinder fill.

Concealing Service Wires

Q. *"Would it be permissible to conceal the portion of the service entrance cable for a distance of about 12 feet within the hollow wall space of a frame building, in order that the meter may be recessed?*

"The local power company has always maintained that the entire entrance cable should not be concealed

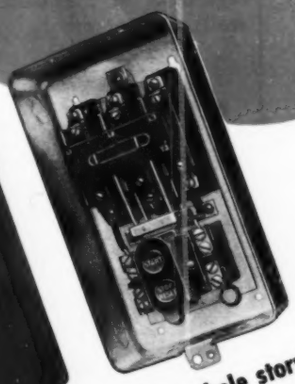
New C-H Manual Starter WITH PUSHBUTTON OPERATION

(NEMA Size 1 for A. C. Motors from 1½ to 7½ h. p.)

Now Cutler-Hammer announces a new Size 1 Bulletin 9115 Manual Starter with PUSHBUTTON operation. This is an entirely new model . . . has the famous C-H Eutectic Alloy Overload Protection, interchangeability of parts with C-H Size 1 Magnetic Starters, and many other positive advantages. Note the compactness of this starter, its modern styling and appearance, its convenience of wiring.

The 3-pole pushbutton starter is priced at only $9.50; other sizes in proportion.

Write at once for further details. CUTLER-HAMMER, Inc., 1306 St. Paul Ave., Milwaukee, Wis. Associate: Canadian Cutler-Hammer, Ltd., Toronto.



These new features tell the whole story

1. New heavy "fine" silver, movable and stationary contacts. Easy to reach for inspection and replacement (interchangeable with contacts on size 1, C-H 9586 Automatic Starters).

2. New clamp type pressure connectors on line terminals.

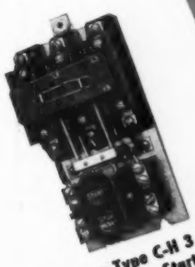
3. New easy operating, quick break pushbutton mechanism.

4. New rubber mounted panel with effective grounding clip. Loosen but one screw to remove panel.

5. New enclosing case; light interior, exceptionally large wiring space, plenty of knockouts.

6. Heater coils interchangeable with size 0, C-H 9115; sizes 0, 1, 2, C-H 9586 and many other standard C-H starters.

7. Available in 2, 3, or 4 pole construction.



Skeleton Type C-H 3 Pole Pushbutton Starter

C-H Skeleton Starters solve many costly "built-in" control problems for busy machinery manufacturers. They offer the same modern construction and features as the enclosed starter shown above.

Dust Safe VERTICAL *Contacts*

CUTLER-HAMMER
MOTOR CONTROL
C-H

Questions on the Code

[FROM PAGE 92]

except that portion which would go through the sill to get to the basement. What ruling would you make on this matter?"—R.A.

A. Very few inspection departments will approve the running of service wires within the hollow wall spaces of frame buildings.

The National Electrical Code from 1928 to 1930 inclusive, contained the requirement that, "Service conductors may be run through but shall not be run within a building wall unless in conduit embedded in brick, tile, concrete, or other fire resistive construction, or unless protected by fuses at the outer end of the service conduit."

In the 1933 Code the above was taken out and the following fine print note substituted. "Service entrance conductors should not be run within the hollow spaces of frame buildings unless provided with automatic overcurrent protection at their outer end."

The effect of this fine print note, which has been continued up to and including the 1940 Code, is that service wires may be run within the walls of buildings but the Code recommends against it.

As stated above, but few inspection authorities permit such an installation and most of them do not approve of it regardless of the Code ruling which really does permit it.

CONGRATULATIONS are offered James Burns of Schenectady (left) by Richard Wahle of Buffalo. Jim has been in the electrical business since 1890, forty-two years as a contractor. He is also proud of two years work with Thomas A. Edison; is a charter member of the New York state association and its present treasurer. Dick is somewhat of an old-timer also, having been a contractor for 35 years.

Because They ALWAYS SATISFY

★ First to be Wrapped and Sealed in Cellophane

★ Perfect Adhesiveness and Tensile Strength

★ Strong Distinctive Green Core

★ Colorful Attractive Boxes

★ A Company in the Insulation Business Since 1878

Sold Exclusively Through Distributing Wholesalers

HAZARD INSULATED WIRE WORKS

DIVISION OF THE OKONITE COMPANY

Works: Wilkes-Barre, Pennsylvania • Offices in Principal Cities

PANTHER DRAGON Friction and Rubber Tapes

Keep Up-to-Date on new developments

through this FREE SERVICE .....

Electrical Contracting brings you the latest literature of leading manufacturers without cost or obligation.

HEATING CABLE

1 Folder GEA-3539 illustrates and describes G-E heating cable, which can be bent and formed to fit any low-temperature heating job. General Electric Co.

MOTOR CONTROL CENTERS

2 A 4-page folder giving features, application, details of construction and typical specifications of motor control centers. The Trumbull Electric Manufacturing Co.

LIGHTING

3 An illustrated folder describing the combination fluorescent - incandescent Fluorelens-Lite and other new fluorescent fixtures. Century Lighting, Inc.

UNDERWATER LIGHTING

4 A 16-page booklet illustrating and describing underwater lighting for swimming pools, fountains and cascades. Russell & Stoll Company, Inc.

QUICK SELECTOR CATALOG

5 A 64-page 1941 revision of the "Quick Selector" catalog. It simplifies the selection of electrical equipment for any motor, lighting or feeder circuit. Westinghouse Electric & Mfg. Co.

FLUORESCENT LAMP BALLASTS

6 Bulletin FBB-0430 gives essential data, wiring diagrams and installation information on fluorescent lamp ballasts. Chicago Transformer Corp.

LIGHTING

7 A new book No. Y-138 is entitled "Let Fluorescent Lighting Roll Back the Roof". It is profusely illustrated with installation pictures. General Electric Co.

TOOLS

8 A hand book on metal cutting. It gives suggestions and hints for proper selection and use of hand and power hack saw blades and flexible back band saws. Clemson Bros., Inc.

V-BELT DRIVES

9 A data book, consisting of 64 pages, on multiple V-Belt drives. It contains practical information for assisting designing engineer and plant engineer in planning and designing new drives. Fort Worth Steel and Machinery Co.

CIRCUIT BREAKER

10 Oil circuit breakers for indoor service are described in this 8-page bulletin, 33-216. Breakers are rated 25,000 kva. interrupting capacity. Westinghouse Electric and Manufacturing Co.

WIREWAY

11 Booklet 445 illustrates and describes the Four By Four Wireway, an enclosed metal raceway designed to house and protect cables and wires. National Electric Products Corp.

DISTRIBUTION DUCT

12 Bulletin 412 consists of illustrations and descriptions on "LO-X" low-reactance design BUStribution Ducts. It also includes specifications and dimensional data. Bull Dog Electric Products Co.

FLOURESCENT FIXTURES

13 Catalog No. 99 consists of 30 pages of illustrations and descriptions of industrial and commercial fluorescent lamp fixtures. Overbagh & Ayres Mfg. Co.

ELECTRIC PRODUCTS

14 Catalog 411 describes and illustrates safety switches, service equipment, lighting panels, circuit master, panelboards, Kbl-duct, switchboards and miscellaneous devices. Price list is given. Bull Dog Electric Products Co.

MOTORS AND CONTROLS

15 A 28-page booklet describing motors and controls for the grain industry. It includes electrical equipment used in all processing from elevator to finished product. Westinghouse Electric & Mfg. Co.

HYDRAULIC EQUIPMENT

16 Catalog No. 41H lists and pictures applications of pipe benders, porto-power maintenance equipment, gauge-equipped jacks, regular and inverted hand jacks and wheeled floor jacks. Blackhawk Mfg. Co.

SOLDERLESS CONNECTORS

17 Catalog 43, consisting of 36 pages, gives descriptions, illustrations and listings of many types of solderless connectors. Dossert and Company.

FLUORESCENT LIGHTING

18 A booklet entitled "There Is Something New in Fluorescent Lighting", pictures and describes a new fluorescent lighting unit known as Model MF-240-N. The Fostoria Pressed Steel Corp.

MOTORS

19 Descriptive data 4004 outlines direct-current motors for service in mines, mills and general industry. Westinghouse Electric & Mfg. Co.

LIGHTING

20 Bulletins F-50 and F-51 illustrate and describe the "Paralume", "Two-Forty" and "Super Two-Hundred". DayBrite Lighting, Inc.

INSULATING MATERIALS

21 A 60-page catalog containing information on entire G-E line of insulating materials, including different varnished cloths, varnishes, Glyptals, tapes, cords, sleeves, varnished tubings, mica materials, wedges and soldering materials. General Electric Co.

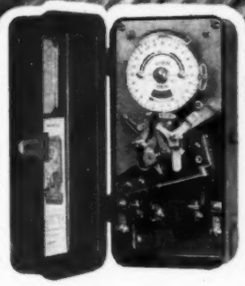
HANGERS

22 Catalog No. 41, consisting of 40 pages of data and illustrations of

[Continued on Page 98]

DOUBLE ..the protection of floodlighting with AUTOMATIC CONTROL..

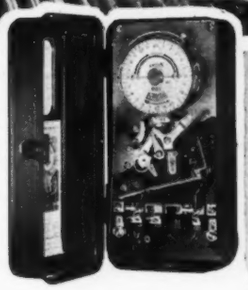
WESTINGHOUSE PHOTO



Form KAZ Astronomic Dial Time-Switch can be set to go "on" at dusk, "off" at dawn, automatically changing daily with suntime.

SANGAMO TIME-SWITCHES

The floodlighting of vital industrial property, such as storage yards, building approaches, transformer banks, and substations, becomes doubly effective when controlled automatically by Sangamo Time-Switches. With an astronomic dial time-switch especially, the factor of human error is eliminated. All worry about turning the lights "on" and "off" at the proper time ceases, and even the resetting of the switch for the changing length of darkness is taken care of automatically. . . . The comparative cost of a Sangamo Time-Switch is negligible.



Form VSWZ, with carry-over, is the time-switch which continues to run during current interruptions. The astronomic dial feature is also included.

SANGAMO ELECTRIC COMPANY SPRINGFIELD ILLINOIS

New Literature

[FROM PAGE 96]

disconnecting and lowering hangers, shock absorbers, suspension devices, accessories and fittings for lighting fixtures. The Thompson Electric Co.

CIRCUIT BREAKER

23 Leaflet B-6165 covers type OX-18 small outdoor circuit breaker for protection in moderate capacity applications. Allis-Chalmers Mfg. Co.

CAPACITORS

24 Catalog No. 164, consisting of 40 pages, covers capacitors for motor starting and other industrial a.c. applications. Cornell-Dubilier Electric Corporation.

TOOLS

25 A 56-page data book on power assembly tools, featuring portable electric screw drivers, nut runners and tappers. The Black & Decker Mfg. Co.

LIGHTING

26 Three new fluorescent bulletins —F-47 illustrates complete line of troffers; F-48 covers the "Kingsway", a new series of glass enclosed type fixtures for direct ceiling mounting and F-49 describes the "Daylume", a new development in plastic. DayBrite Lighting, Inc.

TAPE

27 A four-page, illustrated catalog section on Two-In-One Tape. It combines the functions of tape known as "splicing compound" and friction tape. The B. F. Goodrich Company.

FLUORESCENT LIGHTING

28 Pocket Catalog No. 240 consists of 20 pages of pictures of the entire line of commercial and industrial fluorescent lighting fixtures, together with brief engineering and sales data on each unit. Mitchell Manufacturing Co.

MOTORS

29 Folder D. D. 3175 describes the lint free motors between 1½ and 15 horsepower for the textile industry. Westinghouse Electric & Mfg. Co.

VENTILATION

30 A folder illustrating and describing night cooling fans for homes and apartments. Ilg Electric Ventilating Co.

ELECTRICAL EQUIPMENT

31 A Catalog consisting of 24 pages of data on soldering equipment, under-cutters, coil winder drive, insulation former, arc welder, wire stripper, fish tape reel, lugs, connectors, variable speed pulleys and live centers. Ideal Commutator Dresser Co.

DRYING LAMPS

32 A 12-page folder featuring radiant heat drying lamps. It gives description and shows many typical installations of lamps. Westinghouse Lamp Division.

FLUORESCENT TROFFERS

33 Bulletin illustrating the Vulcan line of recessed fluorescent troffers for office, stores, factories and institutions. Garcy Lighting Co.

FANS

34 A folder illustrating and describing the Coolvent attic fan and kitchen cabinet ventilator. Autovent Fan & Blower Company.

TRANSMISSION BELTS

35 Catalog Section 2150 is entitled "Selection and Maintenance of Rubber Transmission Belts". It answers such questions as —What type, grade, width, thickness and length? The B. F. Goodrich Company.

TIME SWITCHES

36 Catalog 200 illustrates and describes synchronous and hand wound automatic time switches. A selector chart is also given. Reliance Automatic Lighting Company.

BEARINGS

37 A four-page folder describing pre-cast bearing bronze on steel. Illustrations are also shown. Johnson Bronze Co.

TRI-CLAD MOTORS

38 Publication GEA-3580 gives many highlights on the design, construction and aplication of Tri-Clad motors. Many illustrations and some typical industrial applications are included. General Electric Co.

VARNISH

39 A 34-page manual to assist the user in the proper selection and application of insulating varnishes. It is illustrated with pictures, charts and tables. Irvington Varnish & Insulator Co.

SEARCHLIGHT

40 Bulletin GEA-3576 features Type S-5 incandescent searchlight, an aid in protective lighting. It outlines uses, specifications and photometric data. General Electric Co.

FLUORESCENT LIGHTING

41 A folder consisting of specification sheets on various types of lighting units. They outline specifications, performance, construction, and show illustrations. Edwin F. Guth Company.

PROTECTIVE GAPS

42 An 8-page booklet describing protective gaps for distribution circuits. Westinghouse Electric & Mfg. Co.

ELECTRIC HEAT

43 A leaflet for industrial men featuring Drycolene, the gas for no decarburization. Installation pictures and flow diagram are shown. General Electric Co.

FLUORESCENT LIGHTING

44 Bulletin F-46 illustrates and describes 65 watt and 100 watt fluorescent lighting fixtures. DayBrite Lighting, Inc.

[Continued on Page 100]

Circle numbers, sign and paste on a penny postcard or mail in an envelope.

ELECTRICAL CONTRACTING **September**
330 West 42d St.
New York, N. Y. **(Not good after November 1)**

Please send me without obligation, manufacturers' literature herein described and identified by numbers circled below.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70	71	72			

NAME .....TITLE .....

COMPANY .....

ADDRESS .....

CITY .....STATE.....

COMPLETE YOUR BRIDGE TO

THERE'S many an extra-profit opportunity for you in sales of modern intercommunicating systems. You'll make *extra* sales on more jobs if you're prepared to suggest one of Automatic Electric's complete line of quality interior telephones. This extra business fits right into your regular work. There's money for you in the equipment itself and in the labor and materials you supply.

Yes, it's your kind of business—and it's growing! There's an ever-increasing demand for private telephone systems in small factories and shops, tourist courts, offices, stores, hospitals, schools, etc.

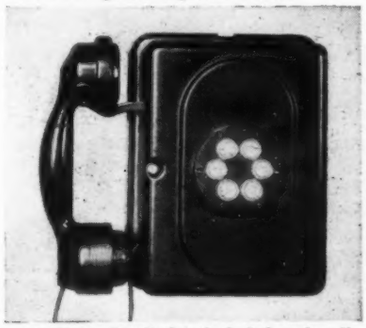
Take advantage of the profit possibilities in this big field. You can be sure of customer satisfaction with these quality products, because Automatic Electric, originators of the automatic telephone, are telephone specialists with a record of fifty years of supplying telephones for public service.

Ask your electrical wholesaler for the facts—find out what this extra business can mean for you. Or if he can't give you complete information, write us direct!

These systems are designed for private service. They are not intended to be connected with the public telephone system.

See this Idealfone display in your wholesaler's salesroom. Notice the excellent appearance, the high quality, the simplicity of this most popular, easy to install private telephone instrument.

Idealfones—*Wall type with molded handsets. Offered with one or five buttons for common talking service up to ten stations.*



Intercoms—*Supplied in both desk and wall styles—with molded plastic handsets. Common talking systems of two to eleven stations.*

P-A-X's—*Automatic Interior Telephone Systems. Provide dial service and secret connections for from ten stations up. Telephones in a variety of types.*

AUTOMATIC ELECTRIC

PRIVATE INTERIOR TELEPHONE SYSTEMS

Distributed by: **AMERICAN AUTOMATIC ELECTRIC SALES COMPANY, 1033 West Van Buren Street, Chicago, Illinois**
Sales and Service Offices in Principal Cities • In Canada: Canadian Telephones & Supplies Limited, Toronto

New Literature

[FROM PAGE 98]

CAPACITORS

45 Catalog 11 embraces specifications and illustrations of the fixed condenser types and ratings generally available. Solar Manufacturing Corp.

V-BELTS

46 Catalog Section 2181 features tables on standard fractional horsepower V-belts. It describes construction of V-belts and advantages of V-drives. B. F. Goodrich Company.

VENTILATING EQUIPMENT

47 Bulletin No. B2529 consists of 40 pages of descriptions, illustrations and tables on fans, blowers and ventilating equipment. American Blower Corp.

MULTI-BREAKERS

48 A four-page folder featuring enclosed industrial multi-breakers, Types M-1 and M-2 for light and power control. The Trumbull Electric Manufacturing Co.

ELECTRICAL CONNECTING DEVICES

49 Catalog No. 11, consisting of 20 pages illustrating and describing this line of multi-contact plugs and sockets, terminals, terminal panels, fuse mounts. Howard B. Jones.

PHOTOELECTRIC CONTROL

50 Bulletin No. 542 illustrates and describes the photoelectric smoke indication and combustion control robot. Rehtron Corp.

SWITCHGEAR

51 A 24-page bulletin illustrating and describing unitized light-duty metal-clad switchgear for control stations and industrial plants. Westinghouse Electric & Manufacturing Co.

VARNISHES AND COMPOUNDS

52 A 40-page illustrated catalog describing insulating varnishes and compounds, their physical and electrical properties and their applications. John C. Dolph Company.

FLUORESCENT LAMPS

53 A pocket size catalog on how to judge the performance of fluorescent lamps. Also a card on hints to electricians for tracing fluorescent lamp troubles. Hygrade Sylvania Corp.

SWITCHES

54 Enclosed disconnect switches for distribution systems are described and illustrated in Bulletin 210. Schweitzer & Conrad, Inc.

FUSE LINKS

55 Descriptive Data 38-665 is an 8-page illustrated leaflet, describing universal fuse links for distribution cutouts rated up to 15 kv. Westinghouse Electric & Mfg. Co.

CONNECTORS

56 Bulletin L-2 gives prices, dimensions and other information on soldering and solderless lugs, connectors and fuse clips. Kolton Electric Mfg. Co.

TRANSFORMERS

57 Booklet B-2266 describes SL transformers up to 10,000 kva. for use in power, municipals and industrial plants. Westinghouse Electric & Mfg. Co.

INFRA-RED LAMPS

58 Bulletin No. 121B on infra-red radiant heat application explains what it is and how it works. Wabash Appliance Corp.

FANS

59 Catalog X4059, consisting of 16 pages, illustrates and describes exhaust and ventilating fans for commercial, industrial and domestic installations. The Emerson Electric Mfg. Co.

CIRCUIT BREAKER

60 Application Data 331-115 discusses the application of power circuit breakers. Tables list necessary data for selection of proper breaker for a given service. Westinghouse Electric & Mfg. Co.

DISTRIBUTION TRANSFORMERS

61 Bulletin B-6159 illustrates and describes standard distribution transformers. It covers design and construction features, as well as dimensions, price lists and electrical data. Allis-Chalmers Mfg. Co.

PROTECTOR TUBES

62 Descriptive data 38-200 outlines De-ion protector tubes to prevent damage to transmission lines during electrical storms. Westinghouse Electric & Mfg. Co.

CHIMES

63 Catalog No. 40 illustrates and describes electric door chimes, bell, signaling and special transformers. The A. E. Rittenhouse Company, Inc.

DISTRIBUITON SYSTEM

64 Circular 335 features the new L-V-D (low voltage drop) BUSS-WA, which has high interrupting capacity, insuring consistency of selection with feeder protective devices of high interrupting rating. The Trumbull Electric Mfg. Co.

SWITCHES

65 A catalog describing and illustrating automatic transfer switches, remote control switches, contactors, relays, control panels and solenoids. Automatic Switch Co.

FLUORESCENT LIGHTING

66 An eight page folder featuring Flurolume, fluorescent lighting for the home. Illustrations and descriptions are given. Globe Manufacturing Co.

ELECTRIC TOOLS

67 Catalog 45 illustrates and describes electric tools for construction, installation, production and maintenance. Wodack Electric Tool Corp.

BALLASTS

68 Bulletin 412-FL consists of 12 pages of data on ballasts for use with fluorescent lamps of capacities from 4 to 100 watts, including high power factor two-lamp ballasts. Complete dimensions and wiring diagrams together with mounting dimensions are given. Jefferson Electric Co.

ELECTRIC DRILLS

69 Bulletin JE-112 is entitled "The Fast, Modern Way to Drill" and it shows the UI4 type ¼-in. capacity, one-hand electric drills. Independent Pneumatic Tool Co.

POWER FUSE

70 Bulletin 200F describes and illustrates the Type SMG power fuse for extra-high voltage service and heavy interrupting duty. Schweitzer & Conrad, Inc.

BALLASTS

71 Folder GEA-3293C contains data on ballasts for Mazda fluorescent lamps. Outlines and wiring diagrams are shown. General Electric Co.

SWITCHGEAR

72 Bulletin B-6012A features metal-clad vertical-lift switchgear. It gives many installation pictures, construction features, outline drawings and circuit diagrams. Allis-Chalmers Mfg. Co.

In the News

ELECTRICAL APPRENTICESHIP STANDARDS LAUNCHED

The recently completed National Apprenticeship Standards for electrical workers were inaugurated at a dinner meeting of the electrical construction industry, August 14th, at the Mayflower Hotel, Washington, D. C.

The meeting, sponsored by the National Joint Committee on Apprenticeship Standards for the Electrical Construction Industry, was attended by 125 representatives of the various branches of the electrical construction industry and Government departments. E. H. Herzberg, chairman of both the NECA Apprenticeship Committee and the National Joint Committee on Apprenticeship Standards, was toastmaster. Speakers included D. W. Tracy, Assistant Secretary of Labor; R. W. McChesney, President, NECA; E. J. Brown, International President, IBEW; W. F. Patterson, Chief of Apprenticeship, U. S. Department of Labor; C. R. Dooley, Director of Training Within Industry, OPM and W. E. Chalmers, Labor Relations Counselor, OPM.

ACTION ON MOTOR SHOP PRIORITIES

The National Industrial Service Association Committee on Priorities recently met in Washington, D. C., with the OPM representatives of copper allocation and the Electrical Industry Advisory Committee. NISA recommended to the OPM representatives that a blanket rating (probably A-10) be extended to the motor repair industry to permit it to get the materials required to service industry.

This action is being taken by NISA in an attempt to eliminate the delay, red tape and clerical work which is involved by using the PD-1 (Application for Preference Rating) forms. NISA recommends that these forms be used only if absolutely necessary. Then a searate PD-1 form must be made out for each different supplier and can only be used for manufacturers, not for jobbers, as the PD-2 (Preference Rating Certificate) sent to the suppliers by OPM cannot be extended.

Public and privately owned utilities, railroads, common carriers, coke converters, metal producers such as mills and foundries, manufacturers of explosives and commercial airlines are all included in a new Repair and Replacement Order PD-67, which permits them to give the motor shops an A-10 priority rating for their repair work. NISA recommends that these customers take advantage of this simple plan so the motor shop can extend this rating to its suppliers. Also, any priority rating received from customers can definitely be used to replace stock and the motor shops are urged to use these ratings for that purpose.

NISA is asking motor repair and service shops throughout the country to take the initiative and call meetings at once, not only of Association members but of all industry members in their respective territories, to present a program to the local OPM representatives.

Members of the NISA Priorities Committee who are working to simplify and clarify the motor shop situation are W. J. Wheeler, chairman; W. W. Hanks; J. M. Pilmer; C. A. Sievert and F. W. Willey. Stewart N. Clarkson, Executive Secretary, is the NISA representative on the Electrical Industry Advisory Committee to the OPM.

DETROIT TO REJECT UNLABELED FLUORESCENTS

After October 1, all fluorescent lighting equipment installed in Detroit must carry the Underwriters' Laboratories label, according to an announcement by James Galbraith, Chief Electrical Inspector of that city.

Certificates of approval by the inspection department will be issued only to fixtures bearing the label or accompanied by evidence of equal electrical and mechanical safety standards.

SO. CALIF. CONTRACTORS ACCEPT FINES

Filing a consent decree rather than fight the case, electrical contractors and associations in Santa Barbara and San Pedro indicted under the anti-trust law in March, 1940 were fined a total of $22,000 and given suspended sentences for a year by Judge Leon R. Yankwich in United States Court, Los Angeles, August 5. Specific fines levied were against Harbor District Chapter, NECA, $5,000; Santa

"I just made some shades for our new fluorescent lights."

NEW COLT INDUSTRIAL MULTI-BREAKERS

Greater Efficiency . . . Safety

at **Low Cost**

Type M-1 15 to 50 Amperes

Type M-2 50 to 100 Amperes

230 Volts AC — 2 and 3 Poles

Your industrial customers have had the need for top-speed production and the continued strain of three-shift operation is placing great demands upon their electrical equipment. Safe . . . automatic protection for lighting and power circuits is of prime importance . . . and the NEW Colt Industrial Multi-Breakers have been designed to meet these requirements. Adequate and reliable breaker performance at low initial and low maintenance costs.

1. **Thermal trip provides time delay on momentary overloads. Magnetic trip assures instantaneous trip on heavy short circuits.**
2. **Tripped position indicated through small window in front cover.**
3. **Common trip breaker units eliminate single phasing.**
4. **Cover mechanism designed for quick-make and quick-break operation.**
5. **Semi dust-tight enclosures . . . surface type . . . front operation permits close banking.**

COLT

ELECTRICAL PRODUCTS

MANUFACTURED BY A WORLD FAMOUS ORGANIZATION

COLT'S PATENT FIRE ARMS MFG. CO., HARTFORD, CONN.

ELECTRICAL DIVISION

In the News

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Barbara County, Chapter, NECA, $5,000; Humphrous-Smith Electric Co., $1,000; McWhinney Electric Corp., $1,000; San Pedro Local C-83, IBEW, $5,000; Local 413 IBEW, $5,000, and 36 individuals were placed on one year probation.

Although indicted earlier, the San Francisco and Oakland contractors have stoutly maintained their actions within the California state law and are determined to fight the case. Judge Roch has set the date of trial for Nov. 18 after several postponements requested by the counsel for the government.

RALPH M. WALKER DIES

Ralph M. Walker, for many years outstanding among the electrical contractors of the southeast and of the country, died at his home in Atlanta on July 30. He had been seriously ill for several years, though periodically able to be about and active in his business.

Born in the middle west, he entered the electrical field in the engineering department of the Commonwealth Edison Co. in Chicago. After a few years there and later with the Buckeye Lamp Co., he decided to step out on his own and joined an electrical construction business in Selma, Alabama. He moved from there to Rome with a branch in Columbus, both in Georgia. He specialized in industrial work, much of it textile, and prospered and in 1916 moved his headquarters to Atlanta.

During the World War, having difficulty in securing metal boxes, Walker started a sheet metal shop and began the manufacture of switch, meter and panel boxes. Gradually this manufacturing activity absorbed so much of his interest and time that a few years ago he personally withdrew from the electrical construction field.

RALPH M. WALKER

He turned over the contracting firm to the direction of his life long associate K. D. White.

This came as an abrupt transition, for Ralph Walker had been steadily growing in prominence as a leader in the national affairs of the electrical contracting industry. He was long a member of the NECA Executive Committee and for several years vice president. In 1939 he received the James H. McGraw Award "in recognition of his long and consistent promotion of a better understanding among electrical men of the principles underlying fair trade policy and the practical benefits of fair dealing."

REPAIR FOR DEFENSE CAMPAIGN

A new "Repair for Defense" campaign stressing property preservation and the remodeling of homes in defense areas, will be sponsored this fall by the building industry, financial institutions and the Federal Housing Administration.

The new program, aimed exclusively at defense production areas, will encourage the conversion of old houses into multiple-family dwellings or rooming or boarding residences. The theme "Defense calls for Home Repairs" will be spread from coast to coast through national and local advertising and the cooperation of builders, contractors, financial institutions, material manufacturers, dealers and others. And new provisions of FHA's property repair (Title I) plan will back up the drive with proper financing facilities. This program, in which thousands of business concerns are expected to cooperate, will continue through the fall season.

REPAIRS AND MAINTENANCE GIVEN PRIORITIES

Essential industries are now assured a steady flow of maintenance and repair parts. The Director of Priorities announced August 8, that a new Maintenance and Repairs Plan was being made available immediately to more than 150,000 producers, manufacturers and agencies in nine industrial classifications. Additional ones will be added as facilities permit.

Those granted the use of the Plan will, upon application on form PD-67, get an A-10 rating which they can apply to their orders for necessary repair and maintenance parts. This rating can be applied only to deliveries of those maintenance and repair parts used in the plant that has been granted the rating. It may not be used to obtain materials flowing into production; nor to obtain excess maintenance and repair parts inventories; nor to obtain parts and materials for plant expansion.

A special emergency rating of A-1-a may be assigned in cases of extreme urgency. This rating may be used only when telegraphic applications have been granted and will be given only in especially urgent cases such as a sudden breakdown, accident, fire or storm damage.

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Industries listed in the present classifications include the following:

1. Commercial airlines maintaining regular scheduled service.
2. Manufacturers of explosives.
3. Plants producing metals and alloys.
4. Mines, including ore dressing, processing plants and smelting facilities.
5. Federal, State, county and municipal services and utilities.
6. Privately owned public utilities.
7. Railroads.
8. Coke converters.
9. Common carrier passenger services.

The Director of Priorities pointed out that this new plan will also aid some suppliers and manufacturers to qualify under the Defense Supplies Rating Plan, which provides special ratings for certain producers based on that percentage of their production which is clearly covered by defense orders.

ON EXAMINING BOARD

Governor Broughton of North Carolina has reappointed Marion B. Haynes, an electrical contractor of Asheville, for a new three-year term as a member of the Board of Examiners of Electrical Contractors. Frank E. Hartis, Modern Electric Co., Durham, who was reelected secretary of the North Carolina Association of Electrical Contractors, was automatically reappointed as a member of the Board.

COMING MEETINGS

International Association of Electrical Inspectors—Northwestern Section, Winthrop Hotel, Tacoma, Wash., Sept. 2–5. Western Section, Hotel St. Paul, St. Paul, Minn., Sept. 8–10. Eastern Section, Mayflower Hotel, Washington, D. C., Sept. 22–24. Southern Section, McAllister Hotel, Miami, Fla., Sept. 29–Oct. 1.

Minnesota Electrical Council—Special meeting concurrent with I.A.E.I. Western Section, St. Paul, Minn., Hotel St. Paul, Sept. 8.

Rocky Mountain Electric League—Annual Convsntion, Estes Park, Colo., Stanley Hotel, Sept. 11–13.

National Electrical Contractors Association—Annual Convention, Rice Hotel, Houston, Texas, Oct. 6–8.

National Electrical Wholesalers Assn.—Semi-Annual Convention, Hotel Statler, Detroit, Mich., Oct. 14–17.

National Electrical Manufacturers Association—Annual Meeting, Waldorf-Astoria Hotel, New York, N. Y., Oct. 27-31.

SKEELS HEADS DAKOTA CONTRACTORS

B. K. Skeels of Bismarck was elected president of the North Dakota Electrical Contractors Association at a recent meeting in Minot, N. D. Other officers elected were Clyde Kieley, Grafton, vice president and R. L. Melville, Bismarck, secretary-treasurer. Retiring president

Charles Wood, Fargo; Sophus Hendrickson, Minot and Paul Kritzberger, Hillsboro were elected to the Board of Directors.

REVISED LAWS AFFECT CALIFORNIA CONTRACTORS

Changes in California law concerning contractors made at the last session of legislature recently finished, and signed by the governor, include the following:

—The license board may require a bond ranging from $250 to $1,000 in cases where license has been suspended or revoked. This will be used to keep out "bad actors."

—Requires all general contractors to list their sub-contractors in bidding on public works and prohibits general contractors from changing any sub-contractor's name without consent of officer or agency accepting the bid. This was the much-sought bill to prevent bid peddling by general contractors.

—Removes 8-hour limitation on all public works to enable contractors to retain their men in competition with national defense work having no such restriction.

—State Department of Public Works must accept bid bonds as well as certified checks on public works bids.

—A moratorium on the sales tax on national defense projects, such taxes to become due and payable only in event that a final determination by the Supreme Court requires the tax to be paid to the state.

—Several changes to the contractor's licensing law permits the Board to limit the field and scope of operations of a contractor to that in which he is classified and qualified. Licensees may take more than one classification but must qualify for them. Clarified many of the license renewal requirements and those dealing with licensing of minors and of owners doing their own work.

MIDWEST LABOR ESTIMATES UP

Electrical contractors in the major industrial areas around Chicago and Detroit are reporting an increase in labor costs on non-defense work as a result of heavy diversion of man power into national defense projects.

Key men are commanding a bonus over the scale of 10 to 25 cents an hour, reports a prominent Detroit contractor, and overtime pay is attracting many of the top grade men to the larger defense projects. Consequently, estimators figuring on non-defense work are hedging against the uncertain speed of available men with safety factors of 20 to 40 percent over normal labor estimates.

As of August 15, there were few reports of serious shortage of skilled electricians in these communities, due largely to the continued influx of men from all parts of the country, attracted by high wage scales and overtime schedules on industrial projects.

Repair work and small jobs can still be handled efficiently and quickly but require careful organization, reports one

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Chicago contractor. In many instances, however, contractors are refusing such jobs or referring their customers to other contractors specializing in small work.

Bidding on non-defense projects is still chaotic, a Detroit contractor reports, estimators are beset by the dilemma of keeping enough work in the shop to hold a full crew of men and submitting prices with a reasonable hedge against unpredictable delays and costs. Some concerns with regular customers providing a good volume of business are refusing to quote on other than a percentage or fixed return basis.

Typical of the comments of leading contractors on the labor supply question are the following—"Labor supply is adequate in numbers but our best men are going for the overtime on big defense jobs"—"We have been figuring 25 percent higher in the labor column but this is not enough to cover the risks in contracting for work running very far into the future"—"Right now we are more concerned with material deliveries than labor supply"—"Bids are too low for the present uncertainties in labor and material."

CONTRACTORS PLAN ESTIMATING COURSE

The Cook County Electrical Contractors Association with the cooperation of the Chicago Board of Education is preparing a 10 weeks night school course in electrical construction estimating, starting in October. The schedule under consideration will cover practical estimating, with sufficient elementary discussion for brush-up, emphasizing accurate estimating methods and records.

MINING EQUIPMENT is the specialty of W. F. Nanstiel, engineer in charge of the motor repair department of the Cooke-Wilson Electric Supply Co., Pittsburgh, Pa. Complicated and tricky electrical control circuits are on his daily diet and he thrives on them. The tougher they come the better he likes 'em.

ENFORCE NEW MARYLAND INSURANCE LAW

At a recent meeting at the Baltimore office of John B. Gontrum, Insurance Commissioner for the State of Maryland, representatives of the various electrical interests were acquainted with the proposed methods for enforcing the electrical provisions of the newly enacted insurance law.

Paul I. Leary, representing the insurance commissioner, outlined the following features of the law:

1. The National Electrical Code will be adopted as standard throughout the State.

2. There will be no State inspection force. The inspection services having jurisdiction at present will continue to make electrical inspections; also at the request of the Insurance Department of the State of Maryland.

3. The Insurance Commissioner will act only when a dangerous condition is brought to his attention by a responsible person or organization. Such reports must be specific and point out that a real hazard exists. An inspection report will be requested of the Underwriters' Bureau operating in that territory. Violations will be brought to the owner's or occupant's attention and a reasonable time allowed for correction. Failure to comply will result in fines and penalties.

4. Any case, in which the order of the commissioner is appealed, may be reviewed by an impartial committee composed of one Underwriters' representative, one utility man and one independent engineer to act in an advisory capacity.

5. Incorporated cities having their own electrical inspection departments are exempt from inspection by the insurance commissioner.

Those attending the meeting were Paul I. Leary, State Insurance Department of Maryland; Paul J. Holland, Public Service Commission of Maryland; C. W. Wheelock and William H. Miller, Baltimore Association of Underwriters; C. M. Harmon, Middle Department Rating Association; Denmead Kolb, of the Eastern Shore of Maryland; Victor H. Tousley, National Fire Protection Association; Arthur L. Abbott National Electrical Manufacturers Association; and F. M. Meredith, Electrical Contractors Association of Maryland.

NAUTICAL CAPERS are being enjoyed by (left to right) Al Sullivan, Tom Connette, Ray Mitchell and Sam Vineberg at the annual Lake Erie cruise of the Electric Association of the Niagara Frontier at Buffalo. Frolicking was in order for the event celebrated the 18th anniversary of the association.

—WITH THE— *Manufacturers*

Allis-Chalmers Mfg. Company has named F. W. Bush as assistant to manager of the Electrical Department. J. F. Sellers has been appointed engineer-in-charge, d.c. design. The Sales Section of the Transformer Division will henceforth be divided into two sections, with G. W. Clothier in charge of Transformer Sales and R. Bell in charge of Feeder Voltage Regulator Sales.

•

Copperweld Steel Company, Glassport, Pa., announces the appointment of William J. McIlvane as general manager of sales. He succeeds Robert J. Frank, who resigned as vice-president in charge of sales on July 31. Mr. Frank will continue as a vice-president and director of the company.

•

Allen B. DuMont Laboratories, Inc., Passaic, N. J., announces the appointment of Walter A. Knoop as sales engineer.

•

American Phenolic Corporation has moved into its new plant at 1830 S. 54th Avenue, Cicero Post Office, Chicago, Ill.

More Gossip

Fargo Shop Expands

Charley Wood, of Fargo, who presides over the North Dakota Electrical Contractors Association, announces a move to larger and better quarters and a change in the name of his contracting business from Central Service to Central Electric Company. The new address is 403 N.P. Avenue. That N.P., in case you wondered, like we did, means Northern Pacific, one of the city's principal railroads.

Speedy Construction

Wagner Electric Company, Inc., Miami, Florida, recently hung up somewhat of a record when they completed the entire electrical installation for the new Intercontinent Aircraft Corp. plant at Miami. They had machinery turning over eleven days after work was started in the 100,000 sq. ft. machine shop and assembly department areas.

A Long Trek

Distance means nothing to Russell W. Raine and his wife who traveled from Miami, Fla., to Buffalo, N. Y. to attend the recent NISA convention. And they enjoyed every minute of the trip. Russ operates the R. W. Raine Co., motor repair organization of Miami.

Boosters

In serving fractional horsepower ventilating motors on the roofs of tall buildings from boiler room panels usually involves considerable voltage drop, especially on starting. And with 208-volt networks and 220-volt motors the condition is further aggravated.

The National Electric Contracting Co. of St. Louis has employed small booster transformers to good advantage on several such installations. The autotransformers are air-cooled, mounted near the motor, and step up 15- to 25-volts. With the transformer in the circuit, the regulation is well within the normal voltage range of the motor.

Pole Wells

On a northern Wisconsin job, a utility crew setting poles encountered bed rock close to the surface. Blasting would risk law suits from nearby home owners. A local well driller brought over a rig, cut 15 holes five feet deep at $2.00 a hole under the blasting estimate.

Meet the Gang

The Stark Electric Company, electrical contractors and motor repair specialists of Baltimore, Md., believe that their customers and prospects should know something about the company personnel as well as the organization's business record.

So they introduce each member of the organization to the prospect and customer through the medium of a mimeographed mailing piece, one for each principal and one for the shop and construction crew. The little autobiographies give the educational, technical and business background of the personnel and gives the prospect a clearer picture of the manpower behind the organization.

The following was extracted from the little story covering the shop and construction crew:

Specialized Field	*Avg. Age*	*Avg. years in elec. business*
Trouble shooters....	36	19
Armature Winders..	38	22
Coil winders	24	7
Industrial wiremen..	38	20
Industrial wiring helpers	25	6
Machinists	43	27
Brush makers	26	10
Sales engineers	44	28

A glance at this resume and the customer knows he is dealing with a highly organized and experienced organization.

More Gossip

Boosts S.D. Wire

Frank Walsh, chief electrical inspector of Pittsburgh, Pa., is a staunch booster of the new small diameter wires, especially the SN types. He is convinced that it is the vitamin needed for the electrical rehabilitation of commercial buildings that are under-nourished from the standpoint of electrical adequacy. Some of it is already going into buildings there, and Frank believes more of it would find its way into ailing buildings if it were not so hard to get.

LIGHTING ADVISOR Mabel Dalrymple of the Industrial Electric Co., of Wichita, Kan., handles home and commercial lighting layouts with a skilled hand. She finds the various adapter devices often pave the way to new fixture installations.

Smoke and Wiring

Smoke elimination as a business builder for electrical contractors seemed rather far fetched until Pat McCaughey, who handles Adequate Wiring activities in St. Louis, explained what is happening there.

Heavy smoke seriously depreciated an otherwise very desirable residential area. Drastic civic action has at last eliminated the smoke. Today homes in the area are being remodeled, and, more to the point for us, rewired. So—no smoke, more wiring business.

All Present

"All present and accounted for," might have been the answer to a roll call of the Maine delegation to the NISA convention at Buffalo. For, in spite of being very busy, Stanley J. Leen, Jr., Bangor and Philip E. Stultz of Westbrook made the trip to gather what ideas they could.

CONFIDENTIALLY Herb Janick, secretary of the New York State contractors association and Louis Horacek (right) both of Rochester, discuss local industry problems at the annual convention of the association at Saranac Inn.

Maxwell Heads A. W. Group

Howard Maxwell, chief electrical inspector of the Ohio Inspection Bureau, was recently elected chairman of the Dayton Adequate Wiring Committee. Mr. Maxwell, who is a staunch advocate of residential wiring adequacy, succeeds Waltel E. Steiner of the Dayton Power and Light Co.

Others serving on the 1941 Committee are: Frank T. Elardo, G.E.L. Electric Co.; Al Longstreet, Supply Corp.; Charles Lyons, Lyons Electric Co.; John Becker, Becker Electric Co. and Mr. Steiner.

New Address

The Endres Electric Company, Madison, Wisconsin, have moved to larger and more modern quarters at 312 West Mifflin Street, in that city. The firm has been active in the electrical contracting business since 1912.

Air Convert

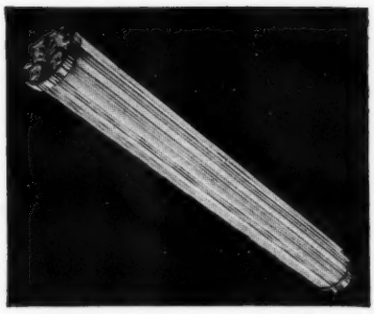
F. M. Mielke and Mrs. Mielke enjoyed their first plane trip when they flew from Duluth, Minn., to Buffalo, N. Y., to attend the NISA convention. "Pop" was so enthusiastic about the trip that he has become a ready convert to airline travel.

Natural Colors Best

On an installation of mobile color lighting at the University of Arkansas Student Union, Supt. G. F. Ehrlich of the Wetherbee Electric Co., of Oklahoma City, Okla., expressed a strong preference for the natural colored lamps against coated or dipped white lamps.

Operated by a thyratron reactor control the system goes through an infinite number of color changes. It seems that the finer color tones from the natural colored lamp mix better.

EQUIPMENT News



GUTH SURFACE TROFFERS

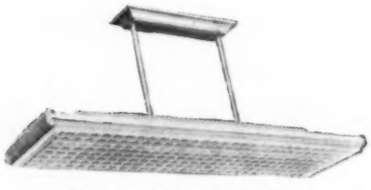
Fluorescent Troffers

The new "G-S-T" glass surface troffers are totally enclosed fluorescent luminaires for one or two rows of lamps. Some of the features are high operating efficiency, flexibility and convenient maintenance. They have "Light-Saver" reflectors, which have a "V" design between lamps and modified "V" between lamps. The enclosing glass is removed without use of tools or tension, covers slip in or out of luminaires whether fixtures are individually or continuously mounted. They are available in base or extension sections for individual and continuous mountings. Edwin F. Guth Company, 2615 Washington Blvd., St. Louis, Mo.

■

Fluorescent Lighting

A new line of fluorescent lighting units, known as "Silvrescent," has just been developed for store, office and similar applications. They are available for either suspension or ceiling mounting. The reflectors are diamond shaped, paralleling the lamps. They provide for end-to-end installation in continuous rows. Egg-crate type louver attachments, with surface area only ½-in. deep, are furnished for each unit. Model 604 F.S. suspension type is a four-lamp, 200 watt unit. Body is 49-in. long, 13-in. wide and 2-in. deep. Length of bottom of shield is 26-in. The 504 F.C. ceiling type differs only in that it is 12-in. wide and extends only 7-in. from ceiling. Graybar Electric Co., 420 Lexington Avenue, New York, N. Y.



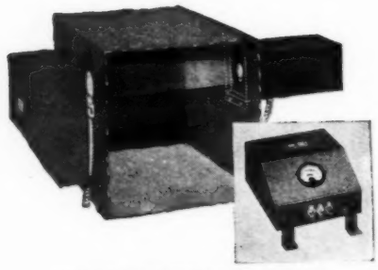
GRAYBAR SILVRESCENT UNIT

■

Bar Hanger

This new S-29 adjustable bar hanger replaces the regular straight, shallow and deep offset bar hangers. It is made in two parts and held together by means of special type set-screw stud, as well as the outlet box, which is fastened to hanger. It has four prongs, two in each end, so bar hanger can be fastened to joist by a hammer, no nails are required. It eliminates possibility of any bulge appearing on surface and is used in connection with various surfacing materials such as plaster board, sheetrock, wall board, pressed wood, beaver board, metal lath, lath and plaster. Appleton Electric Co., 1701 Wellington Ave., Chicago, Ill.

APPLETON BAR HANGER



REHTRON ELECTRIC-EYE CONTROL

Photoelectric Smoke Control

Model SC-301, indicator-signal type has illuminated density meter, which indicates smoke density in breeching or stack and provides for a bell and/or light signal when smoke exceeds maximum allowable density, to warn firemen. Model SC-302, automatic control of smoke elimination equipment has full automatic control for magnetic solenoid valve or blower motor supplying steam/air to over-fire jets. It has adjustable time-delay on load circuit. Rehtron Corp., 2159 Magnolia Ave., Chicago, Ill.

■

BURNDY CONNECTOR

Connector

Versi-Link, type ER connector is used to join copper cable conductors on end, or parallel to each other or at an angle. It may also be used as a coupler or reducer. The swivel principle permits cables to be inserted into either eye from seven different angles and clamps cable in that position. Each cable clamping element will accommodate a large range of conductors. Minimum and maximum sizes are each gripped in connector without any extending parts or exposed threads. Connector sizes are available for cables ranging from No. 8 solid to 1000 mcm. Burndy Engineering Co., Inc., 459 East 133d Street, New York, N. Y.

Industrial Multi-Breaker

This new breaker operates as a motor circuit switch or service disconnect switch. It is fuseless, with bimetallic strip actuation, visible trip indication and trip free lever. It is quick make and quick break, with a rated capacity of 230 volts from 15 to 100 amperes, available in 3 pole, 3 pole solid neutral or 4 pole solid neutral types. Calibration is set at factory and cannot be tampered with. Breaker is completely enclosed and semi-dust-tight. Cutler-Hammer, Inc., Milwaukee, Wis.

CUTLER-HAMMER MULTI-BREAKER

BRYANT RANGE CORD SETS

Make it easier to install and service electric ranges...

Bryant range cord sets, together with Bryant range outlets, offer you three advantages in your range installations. *First*, range connections are simplified with the cord's ready-made fittings and plug cap. *Second*, range servicing is made easier with these simple disconnects. *Third*, there are extra profits for you.

The easy movability will be appreciated by your customers in housecleaning, redecorating or moving.

The finest rubber cable is used in making Bryant range cord sets and connections to contact prongs are electrically welded. The line is complete. Look on page 41 of your Bryant catalog No. 40.
If you do not have a copy, we will gladly send one to you. The Bryant Electric Co., Bridgeport, Conn.

BRYANT
SUPERIOR WIRING DEVICES

ADEQUATE WIRING SERVES AND SAVES

Sold Through Electrical Wholesalers Nationally

Every outlet deserves a Bryant device

EQUIPMENT News

[FROM PAGE 114]

Recorder

This new low-chart-speed recorder telescopes 30-day load and voltage surveys formerly requiring 60-foot strip charts into a chart 30 inches long. It has a speed of one inch per day. In many industrial and central station applications, recorder will probably be used in conjunction with higher chart-speed recorder. It has inkless recording mechanism, which obviates freezing and evaporating difficulties in extreme temperatures. Date and time may be marked at beginning of record, and date and time of any other point can be found quickly by counting each one-inch time line as a day. It is obtainable as an ammeter or voltmeter. General Electric Co., Schenectady, N. Y.

G-E INKLESS RECORDER

■

Terminal Lug

This E-Z terminal lug takes a wide range of wire and cable sizes. With six lugs of this type, user can connect all conductors from No. 8 solid to 1,000,000 cm. There are no loose parts and it can be reused as often as desired. Positive and permanent grip on conductor is assured by self-locking action. Single or multiple posts. Tongues are of any required size and drilling, straight or angle. Penn-Union Electric Corporation, Erie, Pa.

PENN-UNION TERMINAL LUG

Electric Brazer

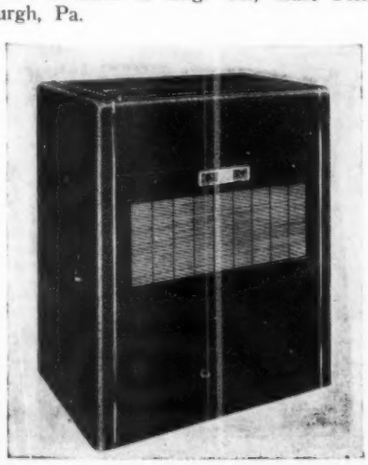
This new electric brazer is for brazing and soldering with silver solder. It consists of power unit or transformer and a pair of electric heating pliers. Holding part to be brazed in pliers, closes secondary circuit causing part to quickly heat to brazing temperature. Heat is controlled by on-off foot switch. Overall size is 14x12x25 inches. It operates on 230 volts, 50-60 cycle power supply. 440 volt and 25 cycle units are also available. Rating is 7½ kva. Ideal Commutator Dresser Co., 1041 Park Avenue, Sycamore, Ill.

IDEAL BRAZER

■

Air Conditioning

A new air conditioning plant designed for small stores, office suites, residences and similar applications. It is known as Type SU-20 Unitaire and provides year-round air conditioning. A steam or hot water heating coil may be added for winter operation. Cabinet of steel houses all mechanism and is built in one section. It is 45 inches high, and may be installed on low wall cases or shelves. Also may be remotely located with ducts connected. It uses two reciprocating condensing units. Safety features include spring-loaded valve which will open, in case of abnormally high discharge pressures, to low side of system. Valve closes automatically when normal pressures are resumed. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.



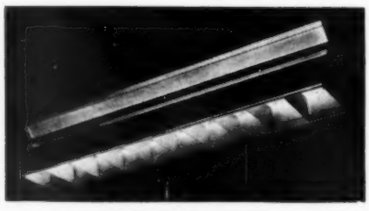
WESTINGHOUSE UNITAIRE

EQUIPMENT News

[FROM PAGE 117]

Fluorescent Fixture

This fluorescent ceiling light, called the Silverline, is for use with 5-foot 100-watt fluorescent lamp. It is made of steel with baked aluminum finish. Overall length of each section is 60¾-in. width at ceiling 9¼-in.; width at bottom 10-in., height 10⅜-in. For 5-foot unit with one lamp ballast 124 watts and for 10-foot two-section unit with two lamp ballast 235 watts. A 9-in. louver is available to cut down surface brightness to a minimum. Louver provides lengthwise shielding of 30 degrees. Individual sections couple together to make up continuous runs, and feeder lines can be carried from one unit to another through large capacity wiring channel. Curtis Lighting, Inc., 6135 West 65th Street, Chicago, Ill.

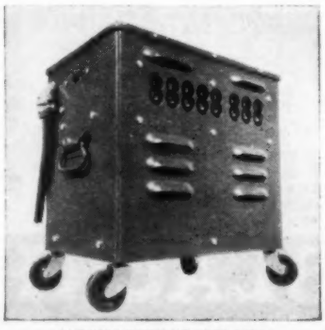


CURTIS SILVERLINE

■

Welder

This Flexarc a.c. welder is for use in welding light gauge metal, castings and drive shafts, general maintenance, and light production work. It is known as Midget Marvel WT-1 and comes complete with all accessories, including electrode lead and holder, work lead, helmet and supply of electrodes. Full load rating is 110 amperes, 30 minutes, 30 load volts, when used on 220 volts, 60 cycle lines. Approximate dimensions are 14½- by 12½- by 20-inches long. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.



WESTINGHOUSE WELDER

Box Bracket

This mounting bracket is easily attached to any standard switch box having $\frac{3}{8}$-in. nail holes in sides spaced on $1\frac{1}{8}$-in. centers. It is equipped with two self-threading screws that center into nail holes in side of box. Bracket is nailed to side of studding so that surfacing material such as plaster board, lies flat against studding. Bracket is scored so that legs may be broken off for close mounting. The M. B. Austin Company, 116 S. Desplaines St., Chicago, Ill.

AUSTIN BOX BRACKET

■

Air Circuit Breaker

This air circuit breaker is designed for use in industrial, central station or power plants, where operation under repetitive duty cycles is required. It is available in 15,000 and 25,000 ampere interrupting capacities in all standard current ratings from 15 to 600 amperes, for operation on one, two, three or four pole 600 volts a.c. or 250 volts d.c. circuits. Breakers are equipped with rotary type, removable operating handle for controlling breaker manually. Available in open-type and three forms for enclosed applications. Standard enclosed breaker consists of open-type unit mounted in housing. Second type is similar except a pull box for wall mounting is included. Third type is for use when breaker is to be mounted on flush type dead front switchboard. Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa.

WESTINGHOUSE CIRCUIT BREAKER

How to

S-P-E-E-D

LIGHTING and DEFENSE JOBS

The October issue of Electrical Contracting is going to be a humdinger, or we miss our guess! Not only will there be a big feature section devoted to MODERN LIGHTING, but also an extra helpful group of articles especially written and timed to assist with today's rush jobs!

You'll need the dope in the Lighting Section for many of your lighting-up jobs this fall and winter. The editors have put together a new method of classifying fixtures . . . applications . . . uses . . . and so on, so that your job of specifying and buying of lighting fixtures will be greatly simplified.

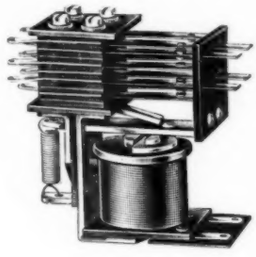
And the other articles: there's one on emergency methods for defense production, for example. Here's another: fifty ideas to cut costs in electrical construction work . . . a check list on keeping maintenance in industrial plants *ahead* of emergency demands . . . plus, of course, all the usual departments.

Keep an eye peeled for this October issue . . . you'll find it of value again and again!

EQUIPMENT NEWS [FROM PAGE 119]

Relay

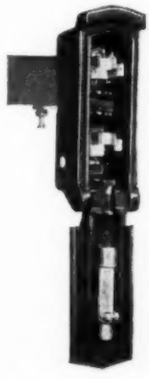
Type "F" relay is available with 1, 2, 3 or 4 poles; either single throw or double throw, to operate on a.c. or d.c. Contacts have self-cleaning, wiping action, with heavy contact pressure. Measurements are 2¼ inches high, 2½ inches long and 1¼ inches wide. G-M Laboratories, Inc., 1735 Belmont Ave., Chicago, Ill.



G-M RELAY

Fuse Cutouts

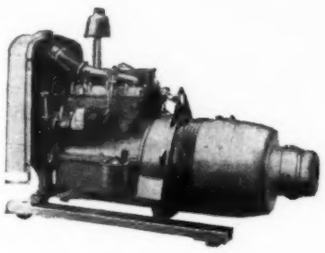
These cutouts combine current-limiting fuses with porcelain-enclosed housings of kind used for distribution fuse cutouts of the non-indicating expulsion type. They extend application of enclosed housing idea to current-limiting fuses for potential and auxiliary transformers. Mounting can be on pole, pipe, crossarm, channel or other similar framework. Available for use with Type EJ-1 Size A current-limiting fuse unit 1-1N amp. at 2500 volts, 60 cycle with interrupting rating of 25,000 amp.; Size B fuse units 1-1N to 3-3N amp. at 2500 volts, 60 cycles and 0.5-0.5N amp. at 5000 volts, with 40,000 amp. interrupting capacity and Size C fuse units from 1-1N to 40-25N amp. at 2500 volts, 60 cycles, with 80,000-amp. interrupting capacity. General Electric Co., Schenectady, N. Y.



G-E FUSE CUTOUTS

Power Plant

Three new low speed 1200 r.p.m. models have been added to this line of Katolight plants. The new sizes are 5,000, 7,500 and 10,000 watts. Available with either two or three wire service or three phase, at 60 cycles. Generators are revolving armature type, generator frame being mounted directly to engine bell housing. Plants are furnished both with separate exciter attached to outer generator end-bell and also with exciter winding carried on main a.c. armature. Complete engine and generator assembly is mounted on rubber. The 5000 watt size can be furnished with automatic control. Larger sizes available only with remote control. Kato Engineering Co., Mankato, Minn.



KATOLIGHT PLANT

■

Soldering Tool

In this soldering tool the heating element is calculated when connected in series, to furnish sufficient heat for normal soldering purposes. A switch is located in handle operable by push button to change element connections from series to parallel, thereby increasing the heat when and if required on heavier or faster soldering operations. Tools available in two sizes —No. 1 consumes 100 watts at normal heat and 400 watts at fast heat and No. 2 consumes 150 watts at normal heat and 600 watts at fast heat. McKinley-Mockenhaupt Co., 626 West Jackson Blvd., Chicago, Ill.

McKINLEY SOLDERING TOOL

Electrical Manufacturers

1942 EDITION CLOSING SOON!

The 1942 edition of Electrical Buyers Reference closes October *1st.* 30,000 copies will be distributed to the leading buyers of electrical products in utilities, in large industrial plants, electrical contracting and wholesaling establishments, railroads, mines, engineering organizations, etc.

Electrical Buyers Reference offers you an unusual opportunity to place *your* condensed catalog (Briefalog) in the hands of this carefully picked list of buyers. *And these buyers USE Electrical Buyers Reference, repeatedly.*

First, because it's the handy, convenient way for them to keep —and *find*—buying and specifying information on the products they use daily.

Second, because a continuous barrage of promotion reminds recipients of the wealth of information that the reference contains and urges them to use it on every occasion. If any one manufacturer did a comparable job promoting his individual catalog the cost would exceed $20,000 yearly!

Add low cost . . . inexpensive "preprints" or reprints of your "Briefalog" . . . year-round contact with your prospects through one volume . . . those are some of the many features which Electrical Buyers Reference offers to the manufacturer of electrical and allied products.

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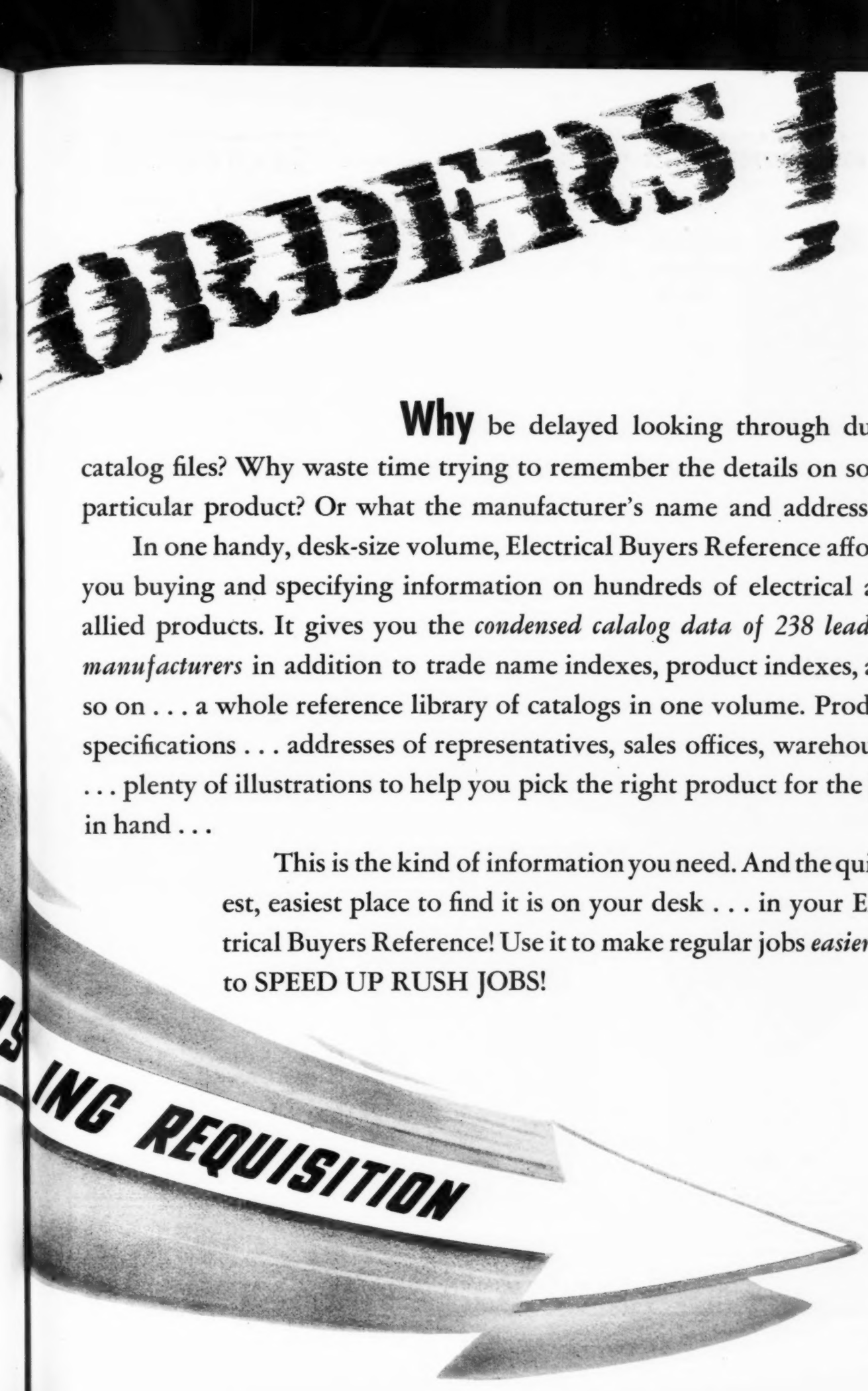
ORDERS !

Why be delayed looking through dusty catalog files? Why waste time trying to remember the details on some particular product? Or what the manufacturer's name and address is?

In one handy, desk-size volume, Electrical Buyers Reference affords you buying and specifying information on hundreds of electrical and allied products. It gives you the *condensed calalog data of 238 leading manufacturers* in addition to trade name indexes, product indexes, and so on . . . a whole reference library of catalogs in one volume. Product specifications . . . addresses of representatives, sales offices, warehouses . . . plenty of illustrations to help you pick the right product for the job in hand . . .

This is the kind of information you need. And the quickest, easiest place to find it is on your desk . . . in your Electrical Buyers Reference! Use it to make regular jobs *easier* . . . to SPEED UP RUSH JOBS!



Standardized Tests For Electric Repairs [FROM PAGE 25]

9. *Load Test.* A load test will locate trouble which might not show up in any other way. Small dynamometers are not hard to make and will show about everything you will need to know on load testing up to three horse-power. For larger tests, a load bank can be built from old grids and a generator used to load up the motor by means of belting. Proper allowances must be made for belt losses.

10. *Locating Trouble.* For locating trouble on the job or in the shop, use an analyzer such as can be bought from any good instrument manufacturer. This instrument will indicate amperes, volts, watts or kilowatts and has a complete set of tables that will help diagnose any motor trouble.

11. *Testing Direct Current Machines.* On direct current machines, the standard tests, namely—opens, shorts and grounds should be used. When a complete machine is available, make a no load running test and check speed, no load amperes and field amperes.

For interpole machines, check for proper interpole connections and correct brush position. A simple combination test for this is to send current through the armature and interpole only with series and shunt fields disconnected. A suitable line rheostat should be provided to keep the current within full load limits. When the brushes are in the correct neutral position, the armature will not rotate. If the brushes are shifted in either direction from neutral, the armature will rotate in the direction of shift from neutral with correct connections. When the non-rotating neutral band is broad, a shift in both directions will usually define the correct mid-point neutral accurately.

With the above set of tests more or less standard in the motor shops, there should be no reason why anyone should be stumped when it comes to discovering what is wrong with a motor. It is something to shoot at for dependable service.

LARGEST MOTOR and apparatus stock in Oklahoma is maintained by A. W. White of Oklahoma City. An unusual number of 100 to 300 hp. machines is carried for the severe service of oil well drilling and pumping.

SEARCHLIGHT SECTION

(Classified Advertising)

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Business : : (Used or Resale)
"OPPORTUNITIES"

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15 CENTS A WORD, MINIMUM CHARGE $3.00

Positions Wanted (full or part time salaried employment only), ½ the above rates payable in advance.

Box Numbers—Care of publication New York, Chicago or San Francisco offices count as 10 words.

Discount of 10% if full payment is made in advance for 4 consecutive insertions.

DISPLAYED RATE

Individual Spaces with border rules for prominent display of advertisements.

The advertising rate is $8.00 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.

An advertising inch is measured ⅞" vertically on one column, 3 columns—30 inches—to a page.

POSITION VACANT

TROUBLE SHOOTERS, Armature and Stator Winders, are offered permanent positions with one of New England's largest and most successful independent repair shops. Only men of good character, long experience, and exceptional ability capable of rapid development to positions of responsibility will be considered. Our employees know of this advertisement. All applications will be treated as confidential. P-25, Electrical Contracting, 330 W. 42nd St., New York, N. Y.

WHERE TO BUY

Equipment, Materials and Supplies for Electrical Construction—Maintenance—Repairs

Alphabetical Index to Advertisers

★ **These companies have supplied additional buying information on their products in the 1941 edition of the Electrical Buyers' Reference.**

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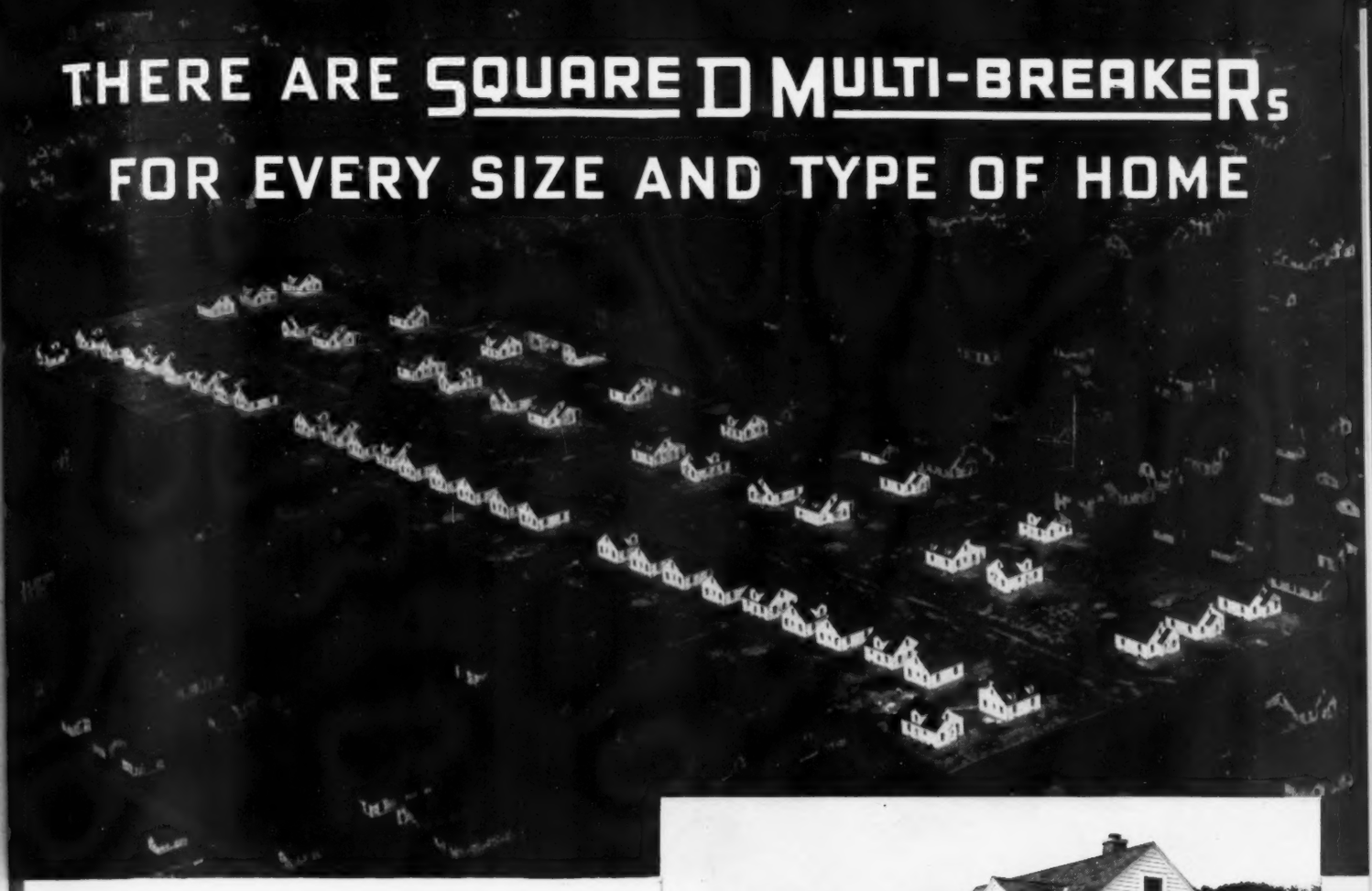
THERE ARE SQUARE D MULTI-BREAKERS FOR EVERY SIZE AND TYPE OF HOME



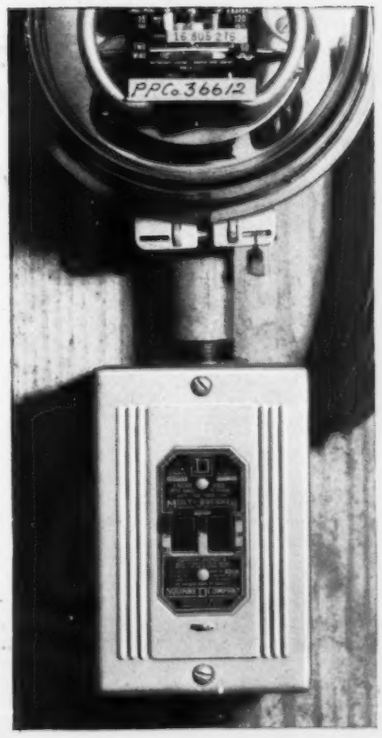
See how little Multi-breakers cost in these 53 Modern Homes in the $4000 class

● The latest addition to this housing project was a group of fifty-three homes, built by the Moline Housing Corporation.

Both the Corporation and its architect recognized the advantages of Square D Multi-breaker convenience and protection. They realized, too, that the Multi-breaker's *visible value* helps sell homes. The only question was cost. Could Multi-breakers be used at a price comparable to that of switch and fuses?

Figures were given by the electrical contractor and checked by the architect. The homes have two-circuit wiring with approximately 25 outlets. The wiring cost was $62.50 plus $18.00 for fixtures, a total of $80.50. *In that cost was only $2.80, list price, for the Square D Multi-breaker.*

Practically all these homes were sold before completion. The owners have the most modern circuit protection—will never have to buy or replace a fuse. The electrical contractor had a nice, profitable wiring job of which he can be proud.



CALL IN A SQUARE D MAN

SQUARE D COMPANY

DETROIT - MILWAUKEE - LOS ANGELES

IN CANADA: SQUARE D COMPANY CANADA LIMITED, TORONTO, ONTARIO

FOR LIFETIME WIRING SYSTEMS

Install G-E WIRES AND CABLES

+ G-E CONDUIT PRODUCTS

+ G-E WIRING DEVICES

WIRING MATERIALS FOR EVERY JOB

For information on G-E wiring materials see the nearest G-E Merchandise Distributor or write to Section CDW-183, Appliance and Merchandise Dept., General Electric Co., Bridgeport, Conn.

GENERAL ELECTRIC